NJIT New Jersey's Science & Technology University

Research Experiences for Teachers (RET) – 2015

LESSON PLAN

MODULE TOPIC:
Introduction to Microfluidics and Drug Delivery Systems

STANDARD(S) & INDICATOR(S):
NGSS- HS-ETS1-3 Evaluate a solution to a complex real-world problem, based on scientific know ledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.
NGSS- HS-LS1-1 Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem.

OBJECTIVE(S): Students will be able to:
Evaluate the effectiveness of different forms of medicine (pill, liquid, injection) in delivering medicine to the body.
Construct a microfluidic device to demonstrate 'flow' in living organisms.

MATERIALS:
Audio/Visual tools to show video- 'routes of drug administration: oral, topical, inhalation, & injection' from study.com- requires sign-in
Handouts
Lab Materials for Construction of Microfluidic device

LIST OF HANDOUTS (attach original copies of each handout - teacher & student edition)
Student Modeling Sheet
Microfluidics Protocols

BACKGROUND INFORMATION:
The development of microfluidic and 'lab-on-a-chip,' devices is now prevalent in many fields of study including chemistry, physics, biology, engineering, and materials science. Microfluidic devices can now be fabricated for low cost and with readily available materials. The construction of such devices provides an opportunity to bring engineering and biotechnology into the high school classroom.

CLASSROOM ACTIVITY DESCRIPTION (LABORATORY/EXERCISES/PROBLEMS) including detailed procedures:
-Students will be introduced to 'challenge question' of "What can I do to feel better faster?"
-Students will generate their own ideas, and be provided with guiding information from videos and text.
-Students will discuss and present their ideas as a class.
-Class will discuss how medicine travels in the blood stream.
-Students will construct a simulated 'microfluidic' device to demonstrate flow in living systems.

SAMPLE QUESTIONS TO ELICIT CLASS DISCUSSION:
What types of drug delivery do you know? Discuss in detail, the benefits and drawbacks of each of these types of drug delivery methods.

HOMEWORK ACTIVITY/EXERCISES/PROBLEMS:
Written discussion of lab results.
Research the benefits and drawbacks of different drug delivery systems.

PARAMETERS TO EVALUATE STUDENT WORK PRODUCTS:
Assessment of students' evaluation of different forms of delivery..
Assessment of effectiveness of constructed device to demonstrate "flow".

REFERENCES:

'Feel Better Faster: All about Flow Rate' Curricular Unit by Michelle Woods- The source of this material is the Teach Engineering digital library collection at www.TeachEngineering.org. All rights reserved.

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