

iPlant Lesson Plan ideas focused on Microarray and PCR Technologies

multi-day activities for Intro. Biology class; submitted by J. Sprung

notes: intended to follow Intro to Genetics unit; students will already have basic understanding of DNA and its structure. AZ State standards for Life Science will be addressed including:

- Strand 1 Inquiry- C1 PO1-4 and C2 PO1-5
- Strand 3 Science in Personal and Social Perspectives C2 PO2-3
- Strand 4 Life Science C2 PO1-2

See also <http://www.genome.gov/Education/> for resources and protocols for wheat germ and cheek cells and more--- gel electrophoresis protocol, sequencing simulation and sequence analysis—in Tool Kit document---available on CD; see also www.genome.gov/page.cfm?pageID=10005911

Activities will include small group work and discussions, individual and shared readings, online video and inter-actives, lab work requiring measuring, observations, and data collection as well as reflection of learning and examination of results. Activities are intended to help ELL students as well as other students to collaborate and develop language as well as scientific understanding.

Day 1: DNA extraction lab----discuss methods and purpose for such; students choose what materials they will extract DNA from...

A simple, easy to follow DNA extraction protocol can be found at http://library.thinkquest.org/19037/dna_extraction.html see also

Day 2: Intro to Microarrays

A number of excellent resources on-line as ppt/pdf...one from USC Bio classes gives overview of genomes and tools for studying including coverage of math algorithms and intro to sequencing databases including BLAST. I would adapt this by selecting most pertinent slides for classroom use...

http://biology.ucsd.edu/classes/bggn220.FA07/11_26_07%20Yeo%20Genomics.pdf

Q & A review---have students create a basic diagram or flowchart/visual labeled of microarray process

Day 3/4: On-line readings regarding microarray technology and applications...

Divide students into groups of 3-4 students/group. Each group will take on responsibility of shared reading, discussing, formulating questions (~20-30 minutes in small group), and presenting key points of information in a 3-5 minute time frame to whole class regarding microarrays (use of computer and projector for presentation encouraged). Four areas of focus for on-line work using above URL are *Research in the News*, *People doing Science*, *Stories of Discovery*, and *Social Impact*. Two groups assigned to explore each category...time flexible. Possibly begin this activity with KWL approach as springboard; finish with peer review and Ticket to Leave at end of activity.

On-line magazine found at http://science-education.nih.gov/newsnapshots/TOC_Chips/toc_chips.html

Day 5: Introduction to Lab- Microarrays....Structure of and How to Use

Show two animations from

http://www.nimblechip.com/corporate/outreach/lesson_plan/index.affx

Discuss and review key concepts as a class; address any remaining questions of students

HW readings for students: use online resources to access Activity 2– students read about structure and function of GeneChip and answer questions http://www.nimblechip.com/corporate/outreach/lesson_plan/student_manual.affx

Day 6: lab activity/simulation...Prep/extract RNA/ hybridization/scanning– create flow chart model; ideal to try wet lab set up... access protocol on–line or APSNet.org/education under Plant Pathways (need to research and choose most ideal/appropriate activity for class application)

Day 7: Exploration activity: given a set of listed materials, in small assigned groups students will build a model of a microarray and build an understanding of the process of lithography...follow Activity 3 in student manual for Affymetrix

http://www.nimblechip.com/corporate/outreach/lesson_plan/student_manual.affx

Small groups will then pair with another group and debrief on what was learned and explain and show off model constructed

Day 8: Activity on reading and analyzing microarray results– Use of computational thinking applied—Introduction and procedure for activity #4 is found at same website above... divide students into 6 separate groups, follow instructions. Each team will analyze data applied to various scenarios...also use genome.gov/11511416 as a resource for presenting mathematical quantification of microarrays– read through for applicability and adapt as needed. Each team presents their results to class at end of class (can be done easily on block day—extended 78 minute class period. Wrap up with student survey, on–line test and/or team poster session as summative evaluation tool.

Key readings for lessons can be found at <http://ppge.ucdavis.edu/Teacher/btsn.cfm>

Applications of genetic engineering in Agriculture can be found at <http://library.thinkquest.org/19037/agriculture.html>

Agriculture-related resources-biotechnology, transgenics, etc. can be found at http://library.thinkquest.org/19037/agriculture_links.html