Using Real-World Problems to Close the Achievement Gap in General Biology

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The Achievement Gap

Four years of success rates in General Biology (Biol 011)

19.6% Achievement Gap

n ~ 8700
General Biology
BIOL 011

Skills
Group work
Biodiversity and ecology

Content

Scaffolding
A “puzzling” instructional techniques process used to move students progressively toward stronger understanding and greater independence

Paraphrased from: http://edglossary.org/scaffolding/

Biodiversity
Ecology
CSI

Communication
Think-pair-share
Group presentation

Commitment
Contract
Skill sets

Collaboration & Coordination
IDENTIFY unknown organisms as trace EVIDENCE

Application
Identify unknown organisms using a KEY

Evaluation & Synthesis
Content

- Geologic time - timeline of events
- Taxonomy
- The three domains
- Characteristics of major phyla

- Abiotic factors
- Biotic factors
- Arroyo Seco fieldtrip
- Native v. introduced species

- Cell structure and function
- Prokaryotic v. eukaryotic cells
- Sexual reproduction
- DNA as evidence for evolution

- Basic anatomy
- The nervous system
- Digestion, chemistry, enzymes
- DNA structure and function

- Autopsy report
- Trace evidence analysis
- Blood testing and body fluids
- DNA gel electrophoresis

Skills

- Sharing ideas
- Observing
- Organizing thoughts
- Identifying common objectives

- Listening to others
- Observing and hypothesizing
- Reading scholarly articles
- Presenting in a group

- Applying the scientific method
- Evaluating sources
- Writing collaboratively
- Developing an argument

- Managing time effectively
- Following experimental protocol
- Collecting data
- Examining personal experiences

- Sharing skill sets
- Analyzing evidence
- Synthesizing information
- Debating collaboratively
Key Elements to Our Redesign

• Incorporation of real-world problems
  – Scaffolded, problem-based learning
  – Collaborative student work
  – Authentic assessment
Using Real World Problems to Increase Student Interest

1. Local Community
   - Introduced Species & Human Impact
razynetters
Arroyo Seco field trip
9/7/2014 #pccbio11

toomuchfun

#introtoecology

Steph959 Arroyo Seco Field Trip #PCCBio11

kkirishitann #biolab #arroyoseco
He has so much potential!

EJ Choi
Jessica Luna
Crystal Rich Pontiveros
Ian Turner

American Sycamore vs. English Ivy

EJ Choi
Jessica Luna
Crystal Rich Pontiveros
Ian Turner
Using Real World Problems to Increase Student Interest

2. Sex and Relationships
   - Human Mate Choice

_Mr. Right_
- Chiseled face
- Well Educated
- Smart
- Strong physique (muscles)
- Likes animals
- Likes to try new things
- Enjoys outdoors
- Protective
- Responsible
- Dresses nicely

_Fit_
- Athletic
- Adventurous
- Facial hair
- Smart

_nice eyes_
- Nice smile/white teeth
- Funny
- Kind
- Understanding
- Not insensitive
- Caring

_elguaposanchez_ What women want. Guys take notes. #pccbio11 #girlswritingabouttheirdreamguy
Using Real World Problems to Increase Student Interest

3. Healthy Living
   - Human Physiology and Adaptation

Frankiaa17 This is why women are awesome :)
#pccbio11

imanuelcg #pccbio11 #thatbalance
Using Real World Problems to Increase Student Interest

4. Crime and Death
   - Crime Scene Investigation

amandapandamedina CSI crime lab evidence #pccbio11 #janedoe

helofelo We have a murder to solve! #pccbio11
The investigation continues on Case 14 on Mr. W.S. on this episode of CSI: Pasadena.

_nikaplease The investigation team searches through the remains of the victim’s clothing. #pccbio11 #csipasadena #detectiveonsite #detectivecarla #inspectorkelly

#ilovethislab
SCIENCE!!!!!

Biology, how I love thee.
In the life of a scientist...

imcelibelli DNA Gel Electrophoresis #pccbio11 #scientists

steph959 Crime Scene Investigation Lab :) #PCCBio11

_nikaplease Case 14 on Mr. W.S. continues with a blood stain test. Each new finding results in a question [rather] than an answer.

What will the team do on this episode of CSI Pasadena?

#pccbio11 #detectivecarla #inspectorkelly #csipasadena
DO U EVEN

DNA BRO
What results have we seen so far?
Success Rates in General Biology at PCC

Effects of Redesign

- Success rates increased for all groups and...
- The Achievement Gap decreased by over 5%

Success Rates in General Biology at PCC

- White & API: Traditional General Biology n = 8750
- Black & Hisp: Traditional General Biology n = 8750

Redesigned General Biology
Closing the Achievement Gap*

Grade Distribution

F12 - SP13 HISPANIC (%)

*significant $\chi^2$ test
$p<0.0001$

n = 190
n = 336
Is it scalable?

Student Count at Semester Start

- F11: 0 (Traditional 876, Redesign 96)
- SP12: 96 (Traditional 794, Redesign 96)
- F12: 142 (Traditional 410, Redesign 312)
- SP13: 423 (Traditional 312, Redesign 510)
- F13: 390 (Traditional 390, Redesign 390)
- SP14: 630 (Traditional 390, Redesign 390)

Legend:
- Blue: Traditional
- Orange: Redesign
Is there a lasting benefit?

Students taking the redesigned course were 16% more likely to remain enrolled in subsequent semesters.
Thank You!

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SCIENCE TECHNOLOGY ENGINEERING MATHEMATICS

PASADENA CITY COLLEGE