

Biosafety Training for iGEM Students

Claudia Gentry-Weeks, PhD, CBSP
Colorado State University
Biosafety Officer, ARO

International Genetically Engineered Machines



"Main Page." *Igem.org*, igem.org/Main_Page. Accessed 2 Oct. 2017.

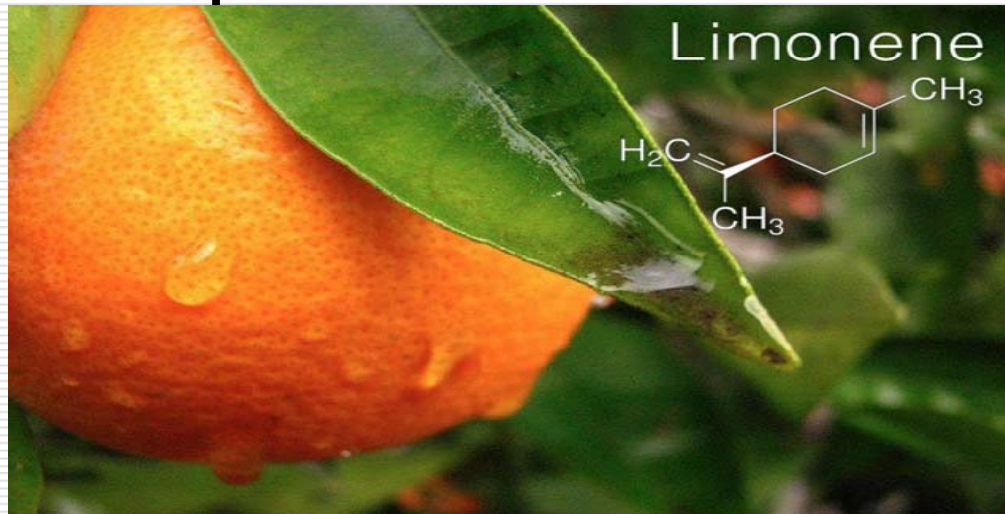
- Use synthetic biology to solve a problem
- Undergraduate students



Manning, Anne. "Synthetic bio student team turns fry oil into plant food, wins a medal." *SOURCE*, 27 July 2017, source.colostate.edu/synthetic-bio-student-team-turns-fry-oil-into-plant-food-wins-a-medal/. Accessed 2 Oct. 2017.

iGEM Project

- Engineer microbes
- High value products



"What is Limonene?" *Cannabis.net*, cannabis.net/blog/strains/what-is-limonene. Accessed 2 Oct. 2017.

Attempt to Construct Gene Drive and Reversal Drive

□ 2016



□ Target = ADE2 gene of yeast

□ NOT COMPLETED

<https://www.statnews.com/2016/12/14/gene-drive-students-igem/>

Biosafety Precautions

“We chose to keep the Cas9 protein on a separate plasmid, rather than integrating it directly into a gene drive. This acts as a *safety mechanism*, preventing the gene drive from functioning without the presence of the separate plasmid”

<https://www.statnews.com/2016/12/14/gene-drive-students-igem/>

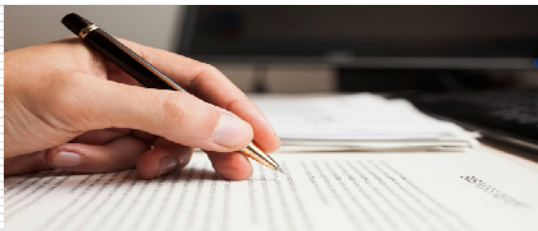
Requested Biosafety Training

- Voluntary
 - Saturday – 6 hours
 - 17 participants; 14 had no training

 - Completion of BSL1/2 training
-

Biosafety Topics

Pre- and Post-Test



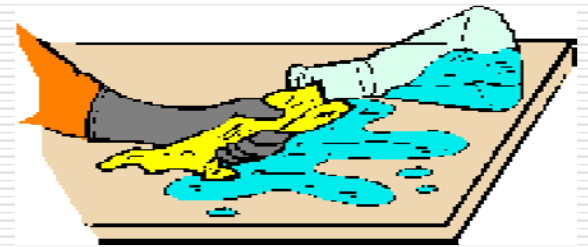
Study.com, Study.com, study.com/academy/course/act-compass-writing-essay-test-practice-study-guide.html. Accessed 2 Oct. 2017.

PPE



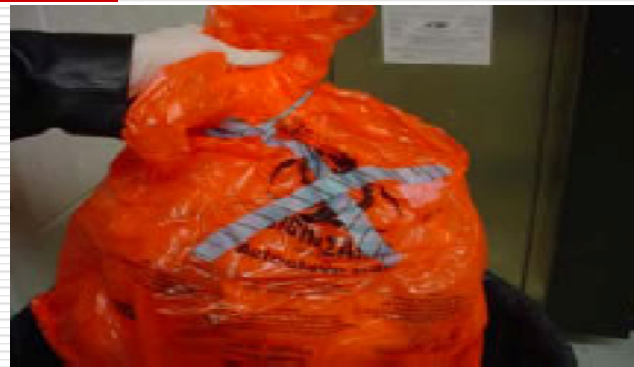
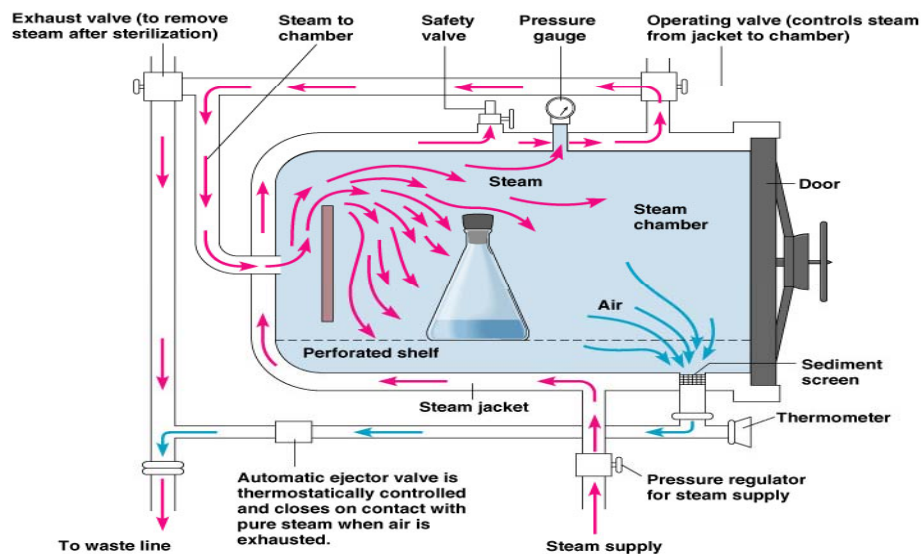
"Glo Germ handwashing training." *Glo Germ: visual tool for handwashing training, aseptic techniques, infection control*, www.glogerm.com/. Accessed 2 Oct. 2017

Spill Cleanup Incident



"Environmental Health & Safety." *Recommended Chemical Spill Cleanup Procedures | Environmental Health & Safety*, www.ehs.ucsb.edu/labsafety-chp/sec2/recommended-chemical-spill-cleanup-procedures. Accessed 2 Oct. 2017.

Autoclave Safety & Validation



"Biological Waste Disposal Policy." *Environment, Health and Safety*, ehs.unc.edu/biological/policy/. Accessed 2 Oct. 2017.



"Dufort et Lavigne." *3M Comply (SteriGage) Steam Chemical Integrator*, www.dufortlavigne.com/en/produit/MMM1243B. Accessed 2 Oct. 2017.



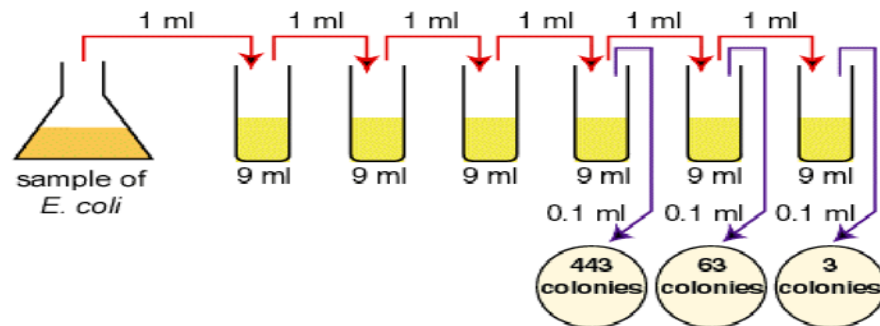
"ProTest Biological Indicator | Biological Indicators." *Mesa Labs Biological Indicators*, 31 July 2017, biologicalindicators.mesalabs.com/protest/. Accessed 2 Oct. 2017.

Medicine, Vanderbilt University School of. "VBI Core Labs." *Vanderbilt University School of Medicine*, medschool.vanderbilt.edu/vbi-core-labs/autoclaves. Accessed 2 Oct. 2017.

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Aseptic Technique

Serial dilutions



BIOL 230 Lab Manual: Plate Count Practice Problem 1,
faculty.ccbcmd.edu/courses/bio141/labmanua/lab4/pc
pp1.html. Accessed 2 Oct. 2017.

Pouring agar plates

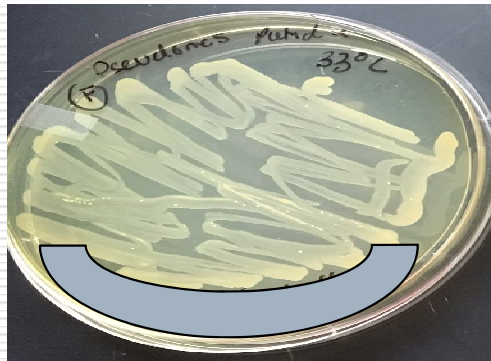


ncbionetwork. "Media Prep." *YouTube*,
YouTube, 14 Dec. 2012,
www.youtube.com/watch?v=cneascR30Ec.
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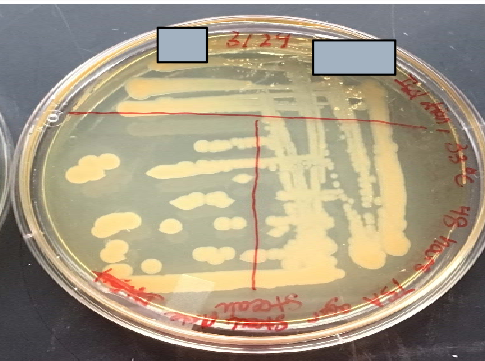
Microbiology

- ❑ Bacteria on surfaces
- ❑ Streak bacterial colonies for isolation

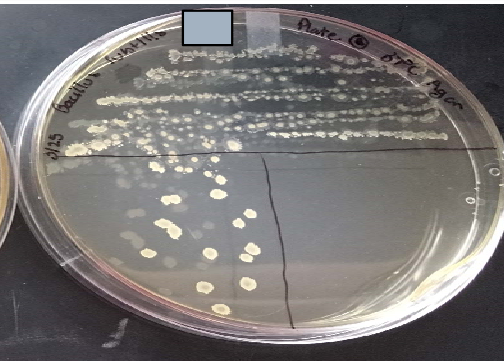
1st attempt



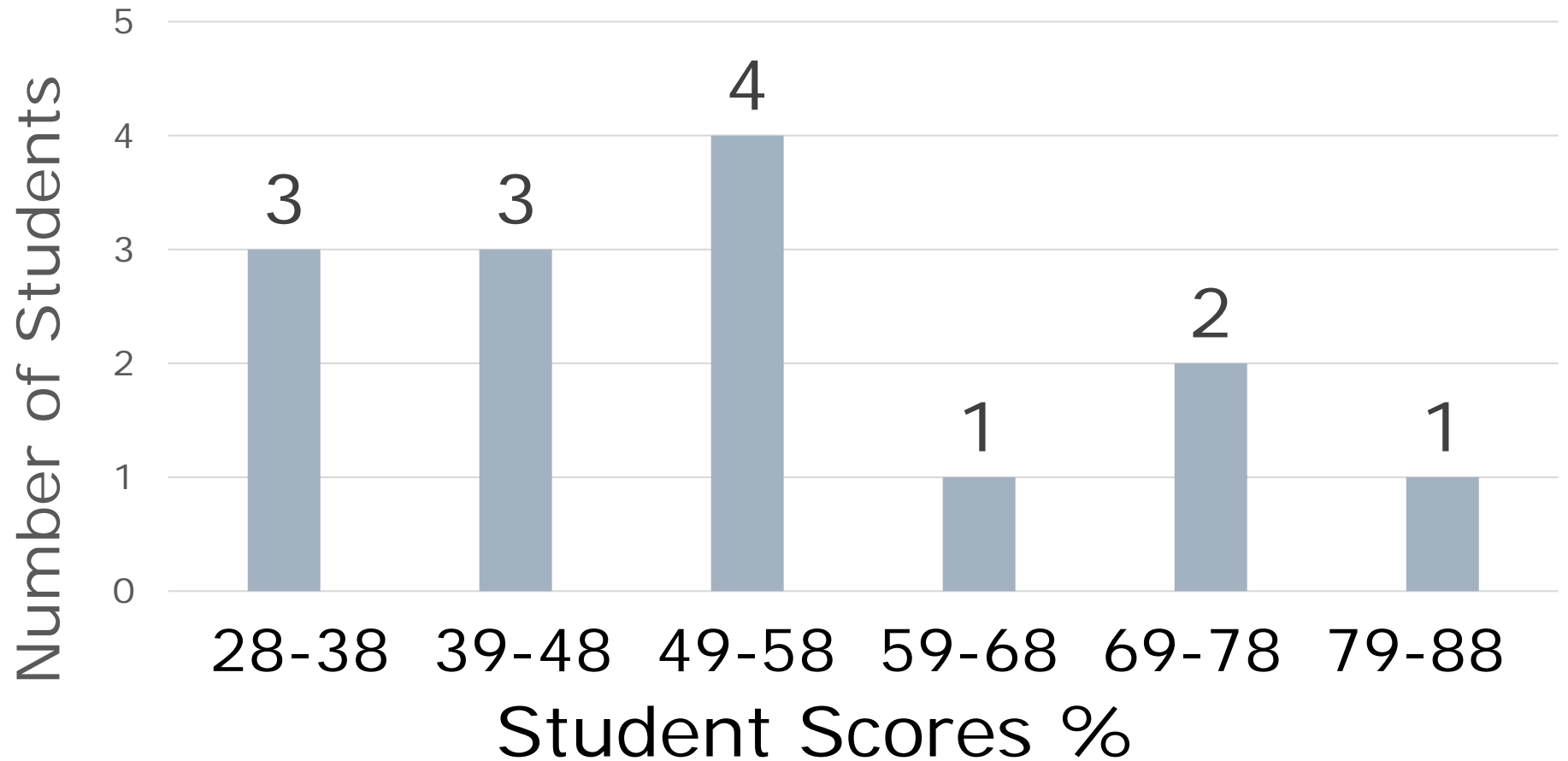
2nd attempt



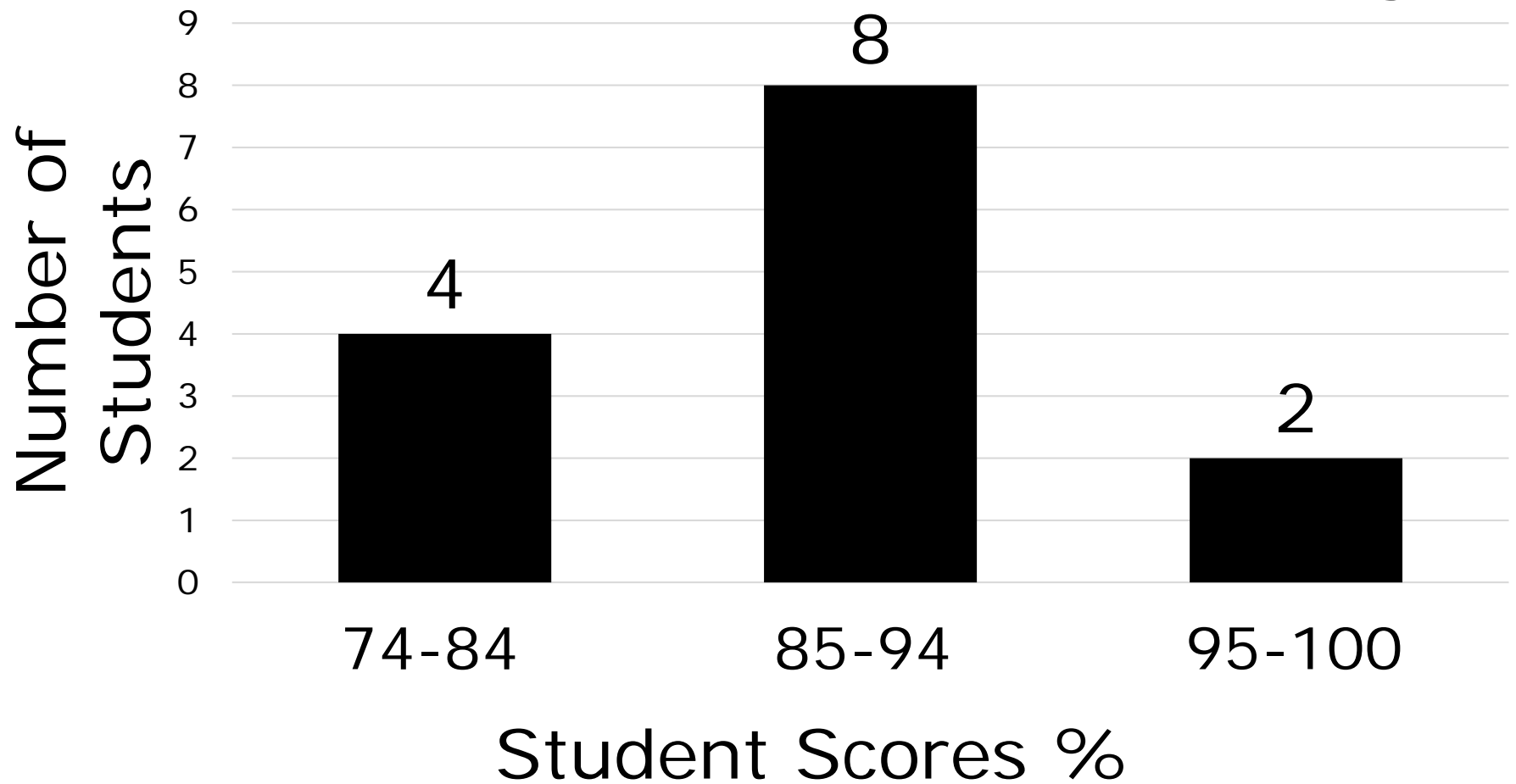
3rd attempt



Distribution of Scores Before Training



Distribution of Scores After Training



Significant Difference Observed?

- Student's t-test
 - Paired 2 Sample for Means
-

Analysis of Results

- Average scores
 - Before 51.20 (SD=17.95)
 - After 87.58 (SD=6.35)

 - This change is *significant* because
 - $p = 2.28 \times 10^{-6}$
-

Areas of Greatest Improvement

- ❑ Autoclave validation – 52%
 - ❑ Precautions for autoclaving liquids - 50%
 - ❑ Chemicals that should not be autoclaved:
43%
 - ❑ Incident response –broken glass/cut finger:
36%
-

Topics Where Students Excelled

□ 100%

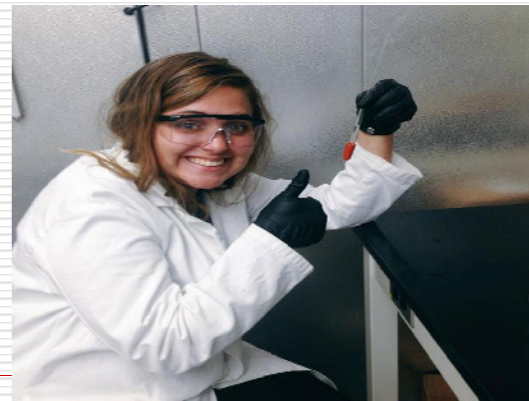


FreeSignPrinter.com

<https://www.pinterest.com/explore/no-cell-phones/?lp=true>

Summary

- ❑ Multidisciplinary – need biosafety training
- ❑ Mixed format = 'Buy in'
- ❑ Active learning



CSU
iGEM
students