UNIVERSITY OF
LINCOLN

# Innovative approaches to teaching in Higher Education

Prof. Mark Clements
Director of Education

# Teaching Innovation

Part 1: Making lectures more engaging

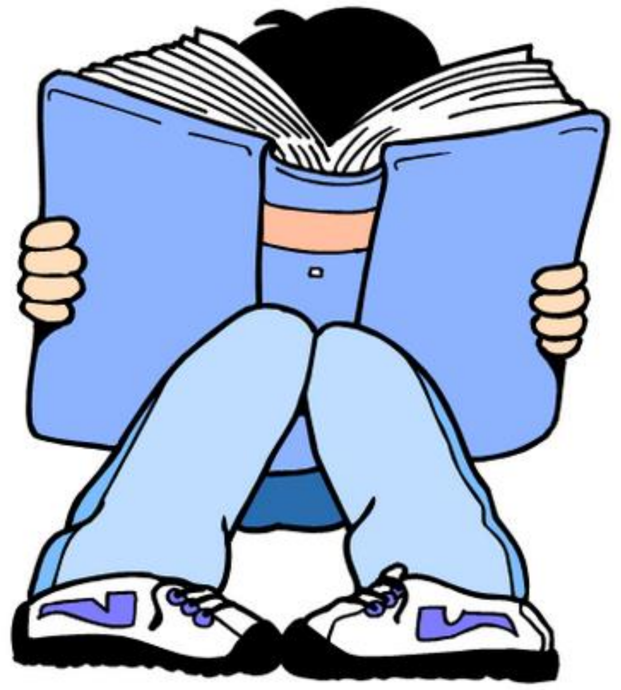
Part 2: Enhancing laboratory practical sessions

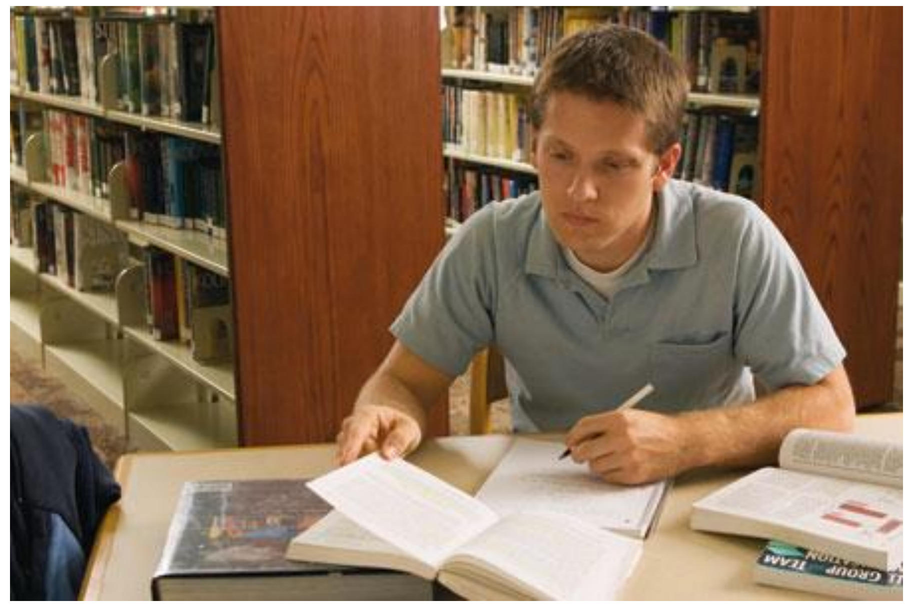
# Traditional lecture

Before

During

After





Independent Study

# Making lectures more engaging

# In class polling

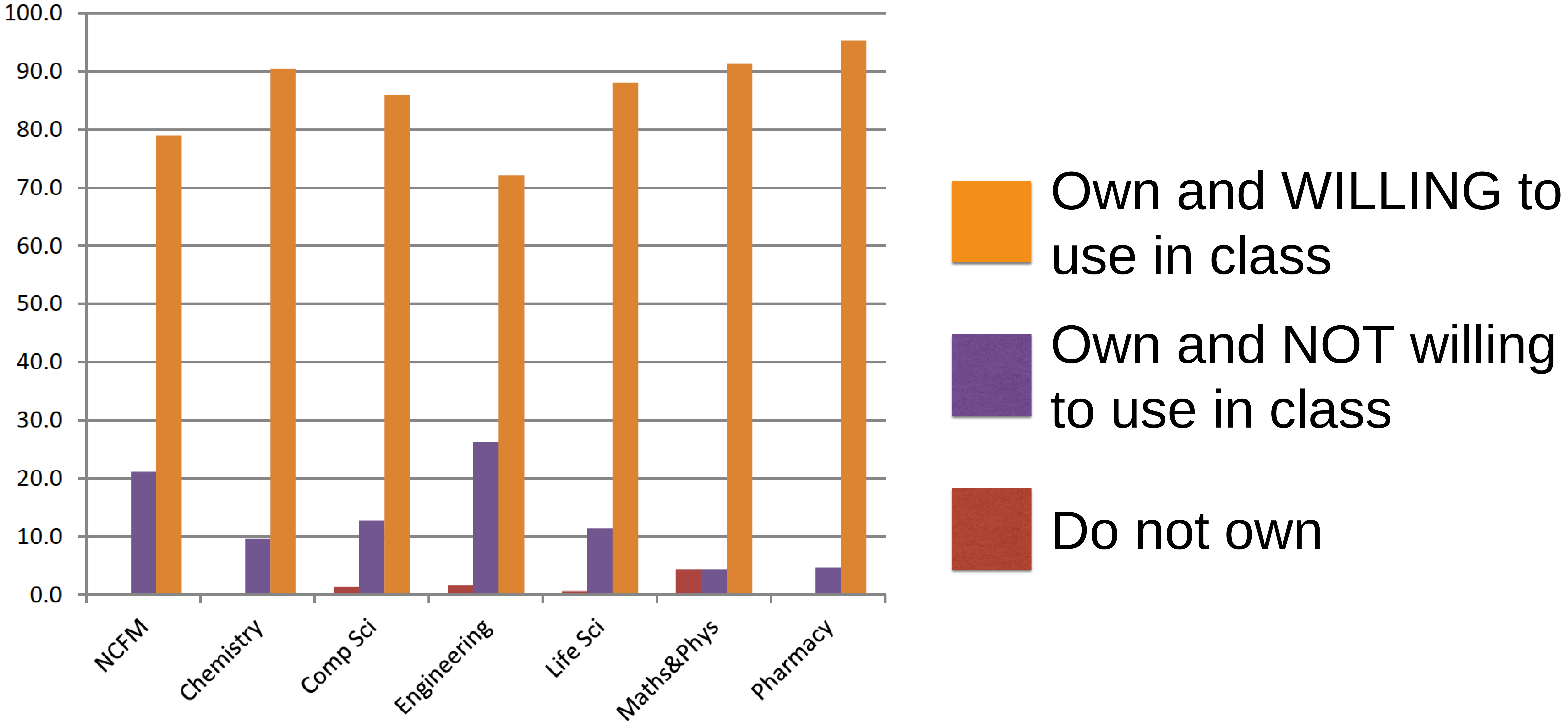
# In class polling

TurningPoint
www.turningtechnologies.com
1/A
2/B
3/C
4/D
5/E
6/F
7/G
8/H
9/I
Login
GO
0/J
?
ResponseCard RF

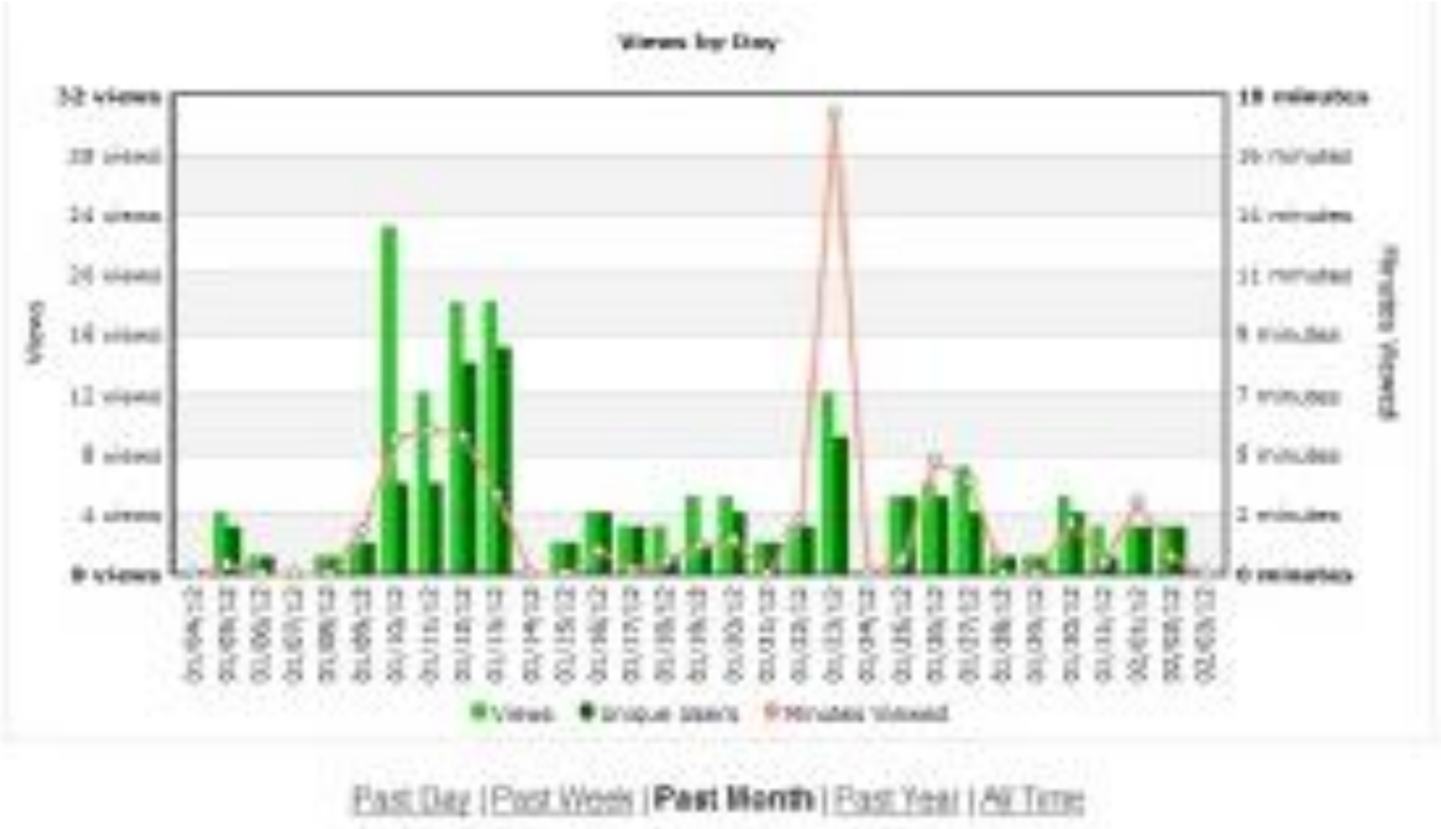
Poll Everywhere

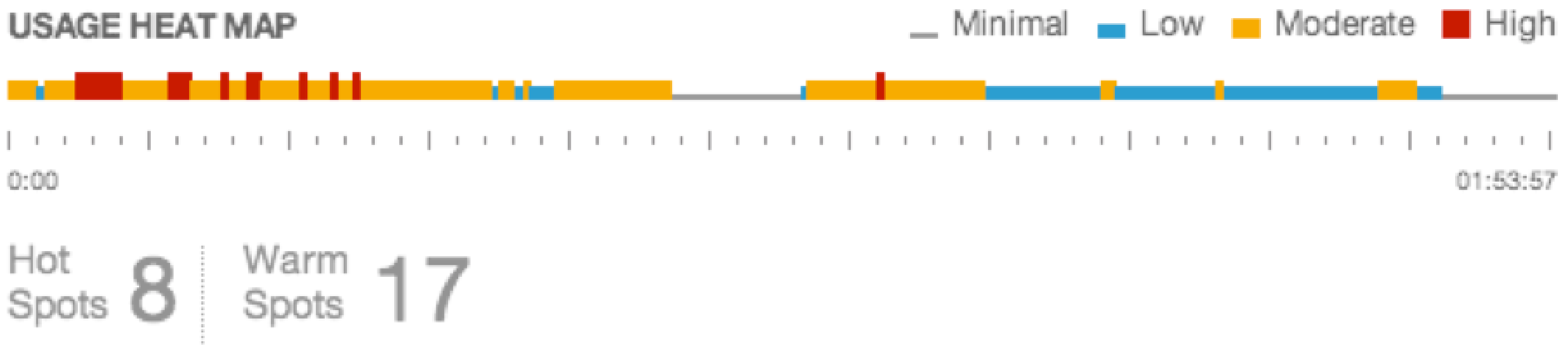
socrative
by MasteryConnect

# Bring your own device



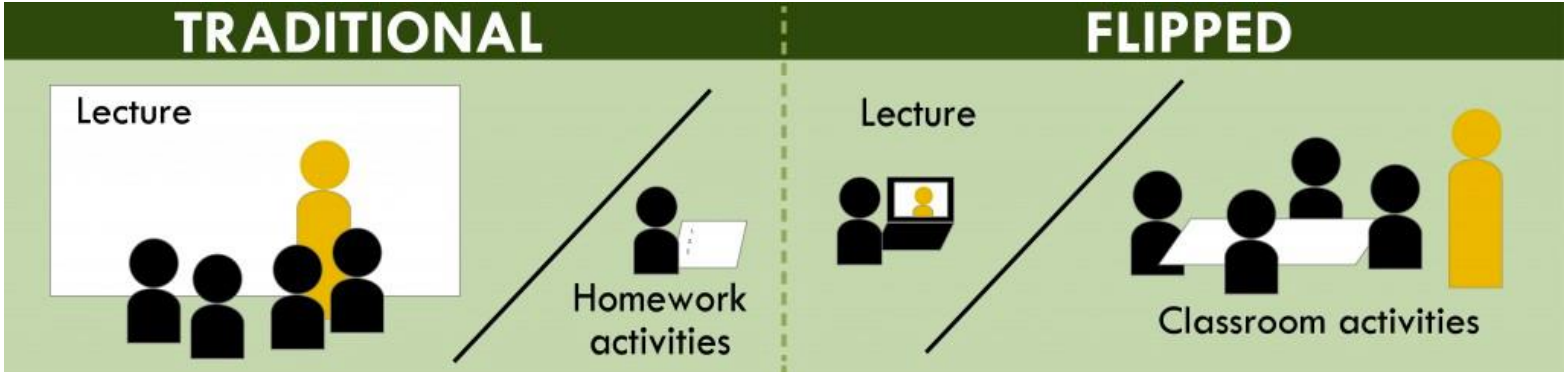
# Lecture capture




USAGE HEAT MAP
Minimal
Low
Moderate
High
0:00
01:53:57
Hot Spots 8
Warm Spots 17

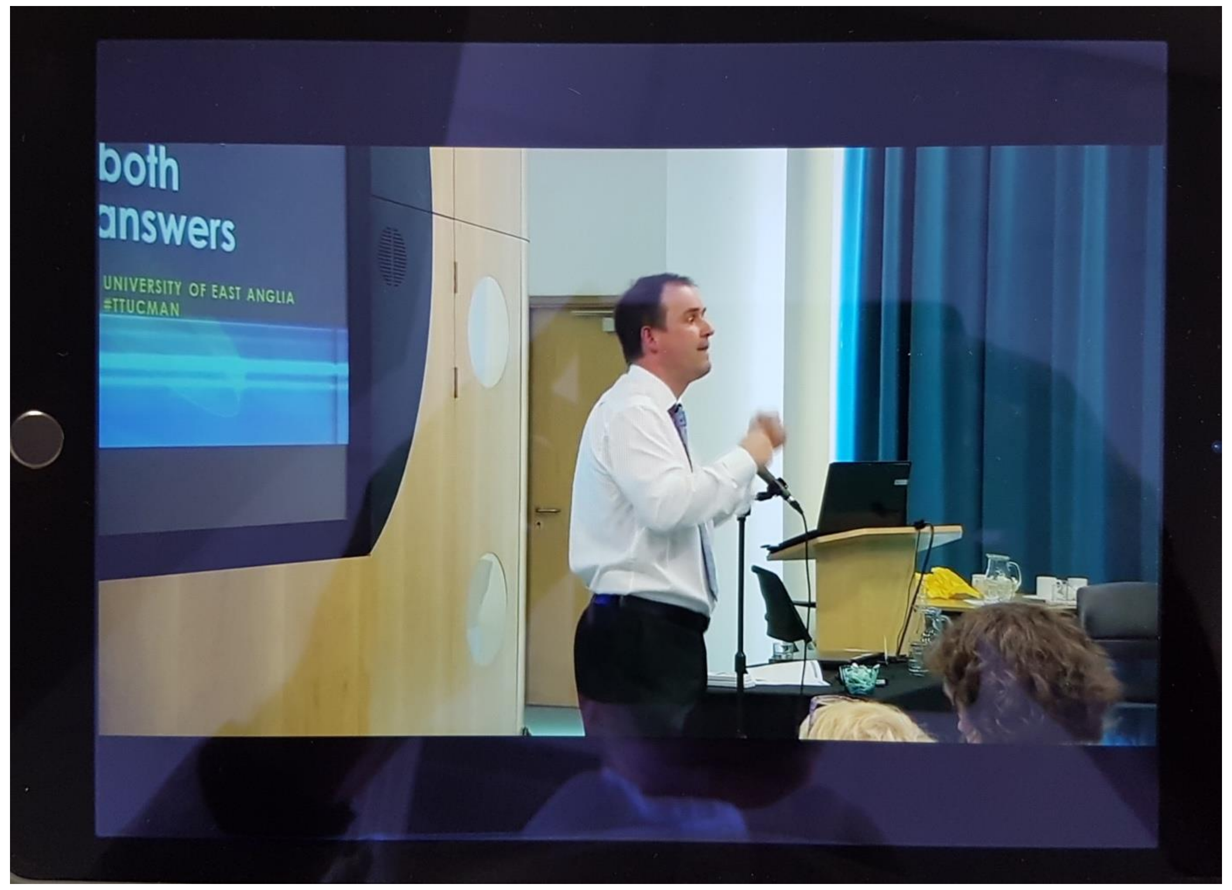
1 hour Lecture → 3 min Summary

# The flipped classroom


TRADITIONAL
FLIPPED
Lecture
Homework activities
Lecture
Classroom activities

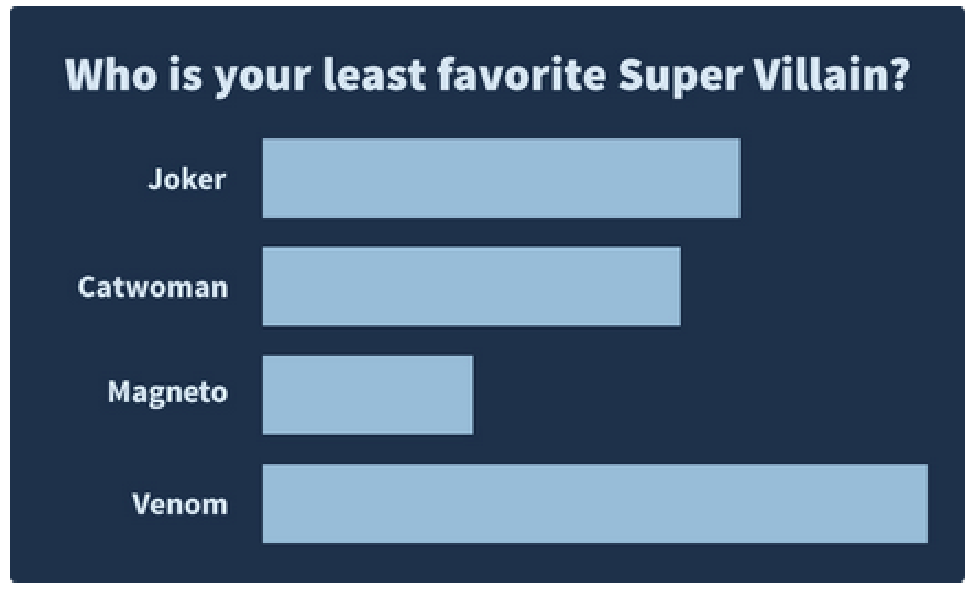
.washington.edu/teaching/teaching-resources/engaging-students-in-learning/flipping-the

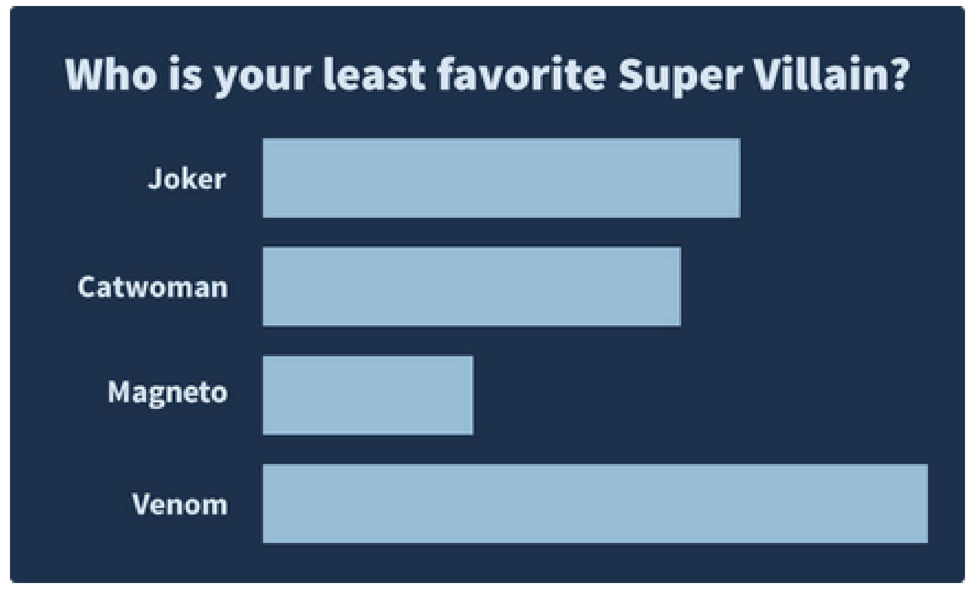
# Peer instruction


both
UNIVERSITY OF EAST ANGLIA

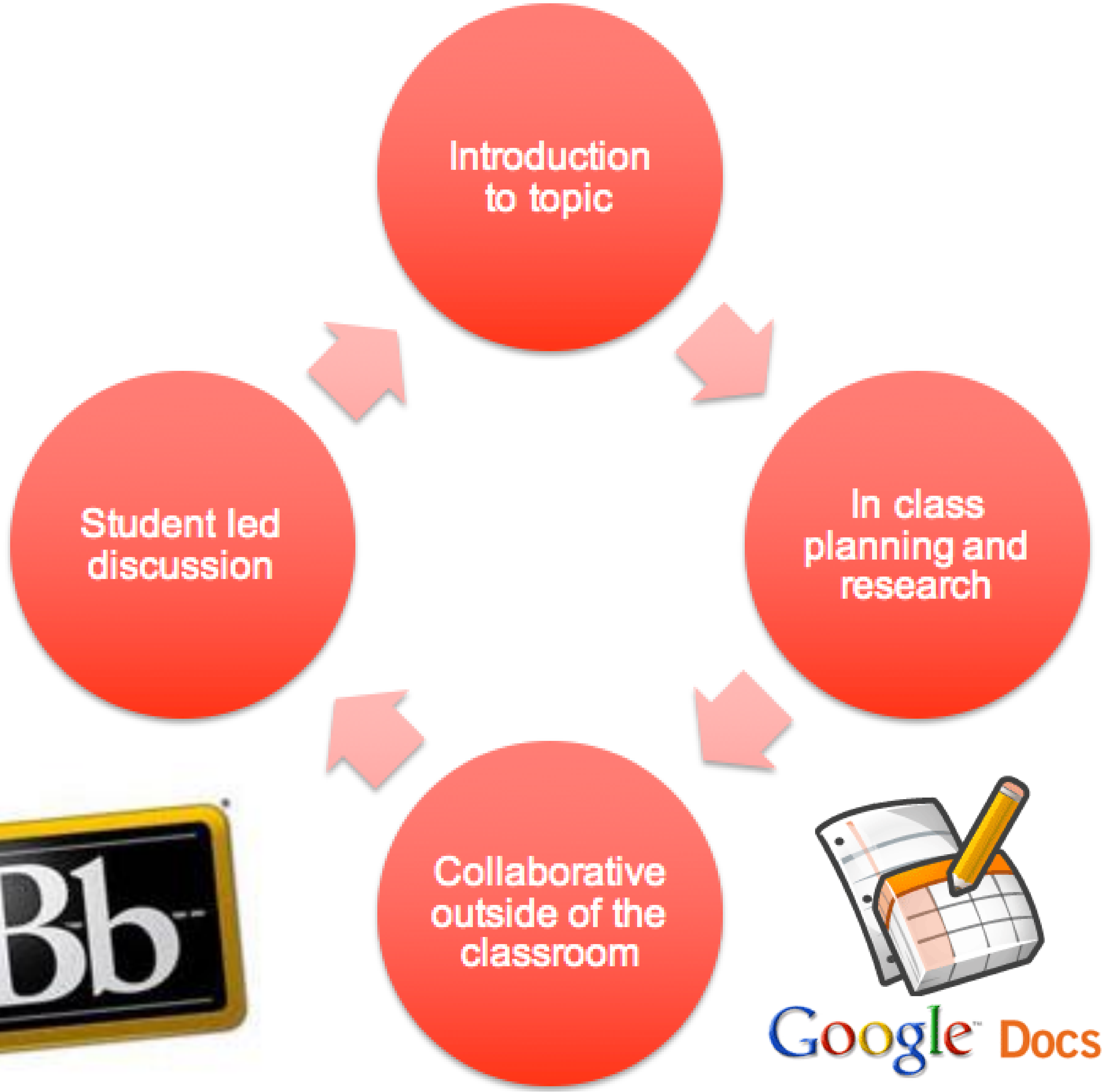
Simon Lancaster, UEA

Conceptual Question




Who is your least favorite Super Villain?
Joker
Catwoman
Magneto
Venom

# Double flipped classroom



Introduction to topic

In class planning and research

Collaborative outside of the classroom

Student led discussion

Google Docs

# Active Lecture

Podcast
Vodcast

PANOPTO
capture, stream, learn

Before
During
After

Online
Tests

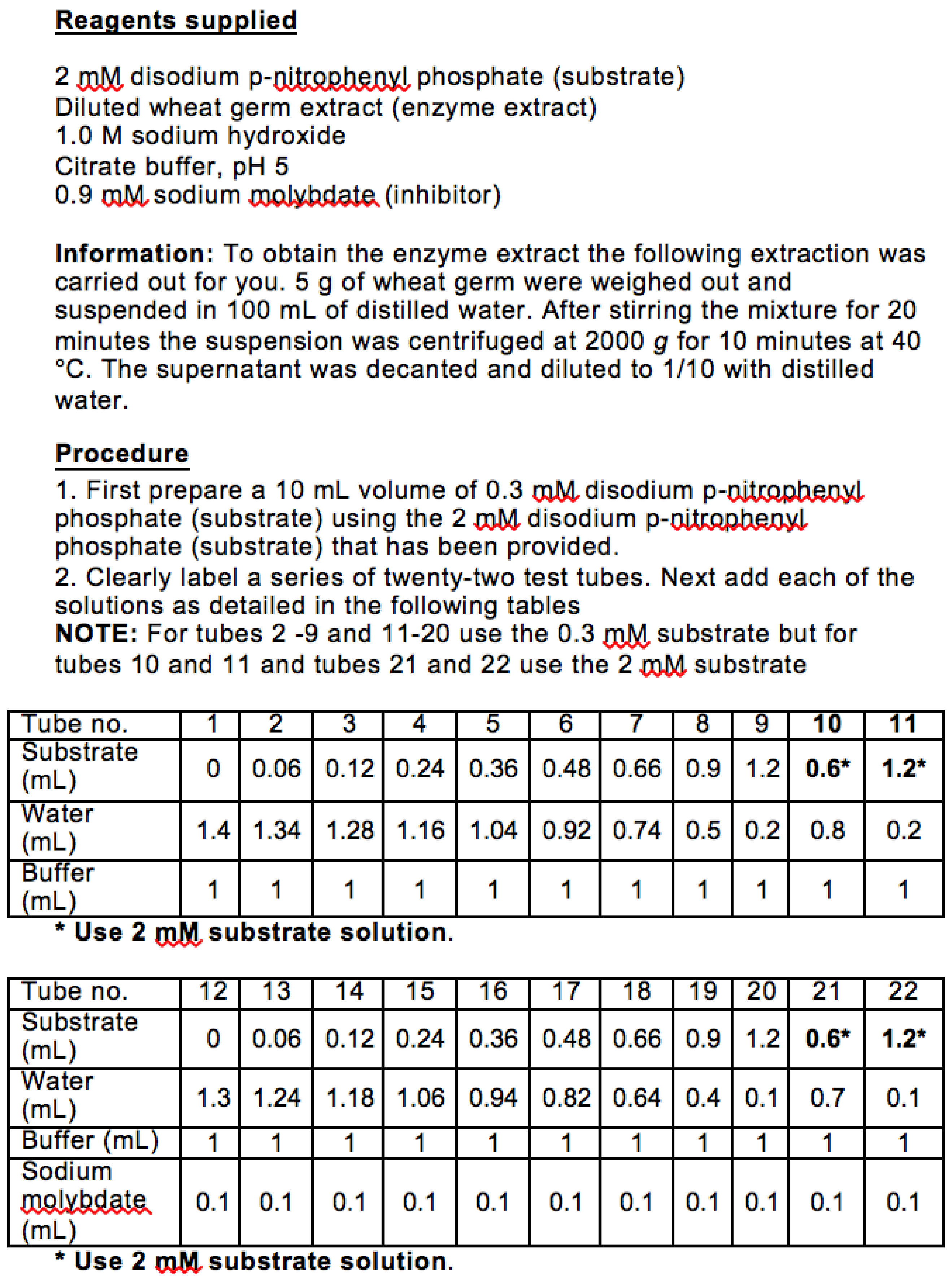
Add Interactive Tool
Create Discussion Board Link
Create Chat
Create Virtual Classroom Link
Create Groups Link

# Student as consumer

*“I feel that given is education is costing me £9000, I am no longer a student, I am a customer……”*

# Enhancing laboratory practical sessions

# Traditional Practical



**Reagents supplied**

2 mM disodium p-nitrophenyl phosphate (substrate)
Diluted wheat germ extract (enzyme extract)
1.0 M sodium hydroxide
Citrate buffer, pH 5
0.9 mM sodium molybdate (inhibitor)

**Information:** To obtain the enzyme extract the following extraction was carried out for you. 5 g of wheat germ were weighed out and suspended in 100 mL of distilled water. After stirring the mixture for 20 minutes the suspension was centrifuged at 2000 *g* for 10 minutes at 40 °C. The supernatant was decanted and diluted to 1/10 with distilled water.

**Procedure**

1. First prepare a 10 mL volume of 0.3 mM disodium p-nitrophenyl phosphate (substrate) using the 2 mM disodium p-nitrophenyl phosphate (substrate) that has been provided.
2. Clearly label a series of twenty-two test tubes. Next add each of the solutions as detailed in the following tables

**NOTE:** For tubes 2 -9 and 11-20 use the 0.3 mM substrate but for tubes 10 and 11 and tubes 21 and 22 use the 2 mM substrate

| Tube no. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | **10** | **11** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Substrate (mL) | 0 | 0.06 | 0.12 | 0.24 | 0.36 | 0.48 | 0.66 | 0.9 | 1.2 | **0.6*** | **1.2*** |
| Water (mL) | 1.4 | 1.34 | 1.28 | 1.16 | 1.04 | 0.92 | 0.74 | 0.5 | 0.2 | 0.8 | 0.2 |
| Buffer (mL) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

*** Use 2 mM substrate solution.**

| Tube no. | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Substrate (mL) | 0 | 0.06 | 0.12 | 0.24 | 0.36 | 0.48 | 0.66 | 0.9 | 1.2 | **0.6*** | **1.2*** |
| Water (mL) | 1.3 | 1.24 | 1.18 | 1.06 | 0.94 | 0.82 | 0.64 | 0.4 | 0.1 | 0.7 | 0.1 |
| Buffer (mL) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Sodium molybdate (mL) | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |

*** Use 2 mM substrate solution.**

# 3 minute video

Katharine Hubbard,
University of Cambridge

Clare Miller,
University of Lincoln

http://www.sms.cam.ac.uk/media/2056274

Explain Everything

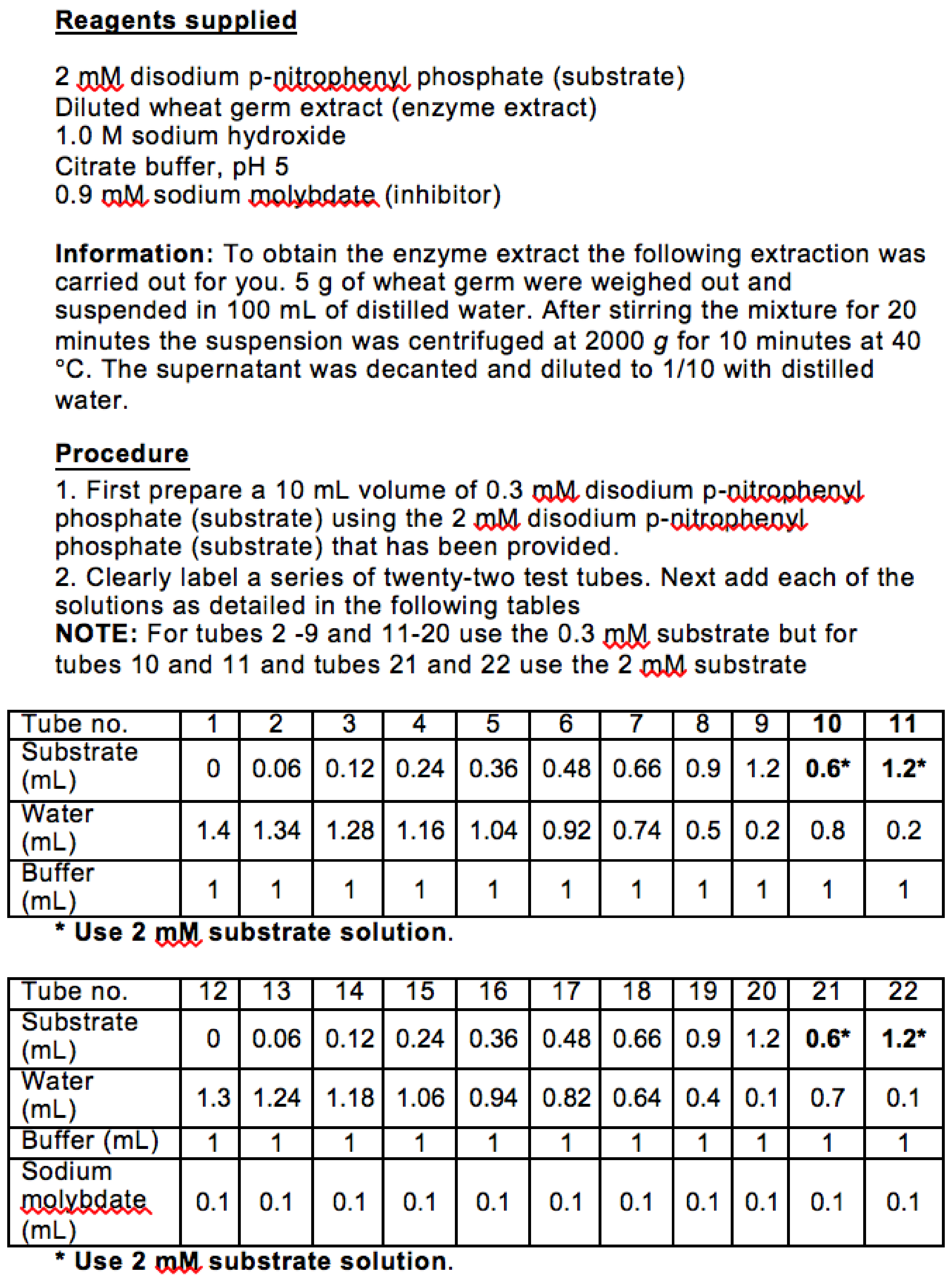
Adobe Voice

YouTube

BOOK CREATOR®

Pinterest

# Traditional Practical



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*** Use 2 mM substrate solution.**

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| Buffer (mL) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Sodium molybdate (mL) | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |

*** Use 2 mM substrate solution.**

# Can we adapt the practical schedule to encourage deeper learning?

# Recall, Adapt & Apply

Alison Sinclair

http://tinyurl.com/hlkp3wt

*"Provide all equipment and reagents - but limited instruction so they need to recall prior knowledge & experience"*

*"Transition between simply following a fail-safe set of instructions to being able to adapt a known approach to solve a new problem"*

# What happens if you allow students become teachers?

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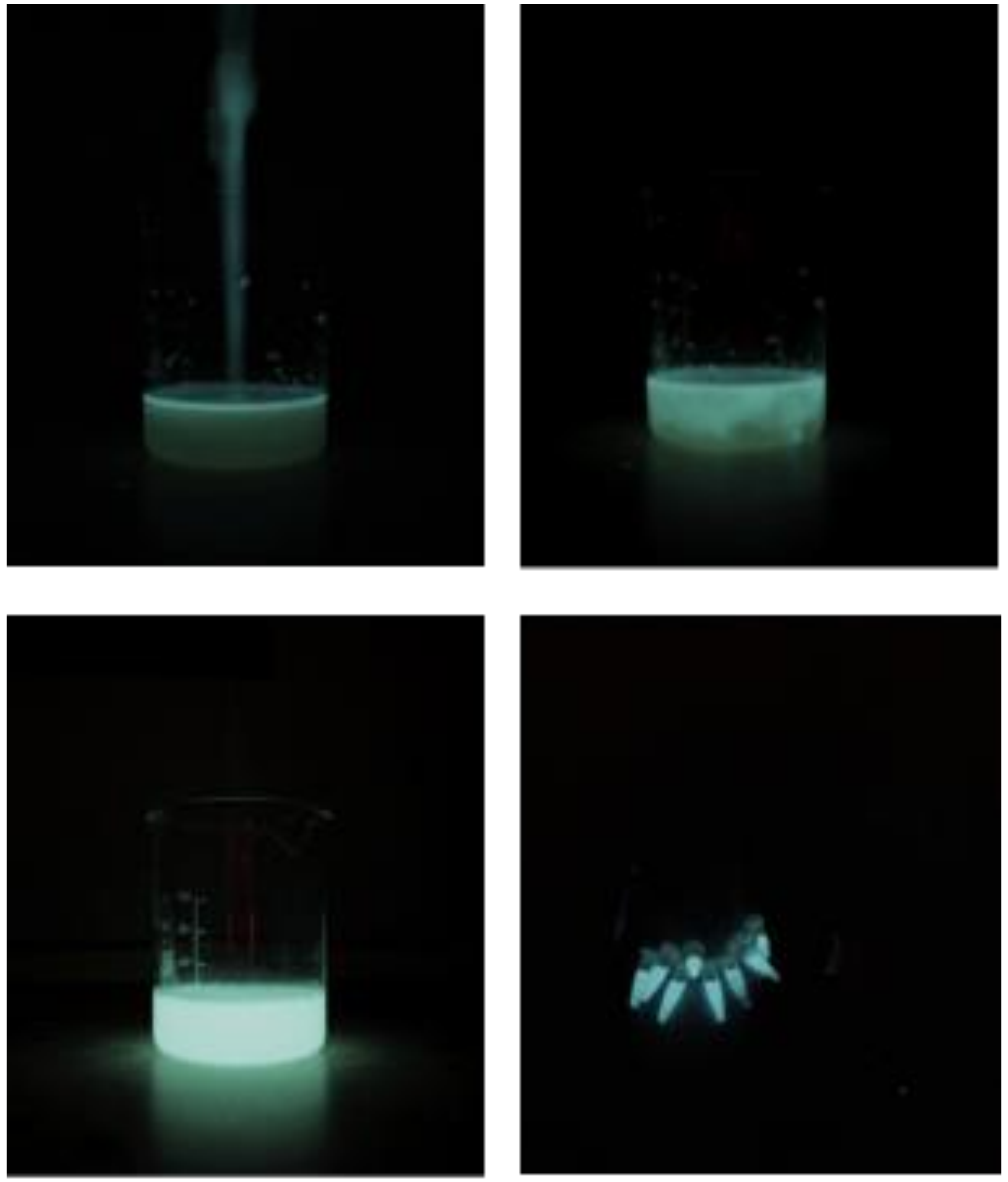
What happens if you provide biology students to work creatively with students from outside their discipline?

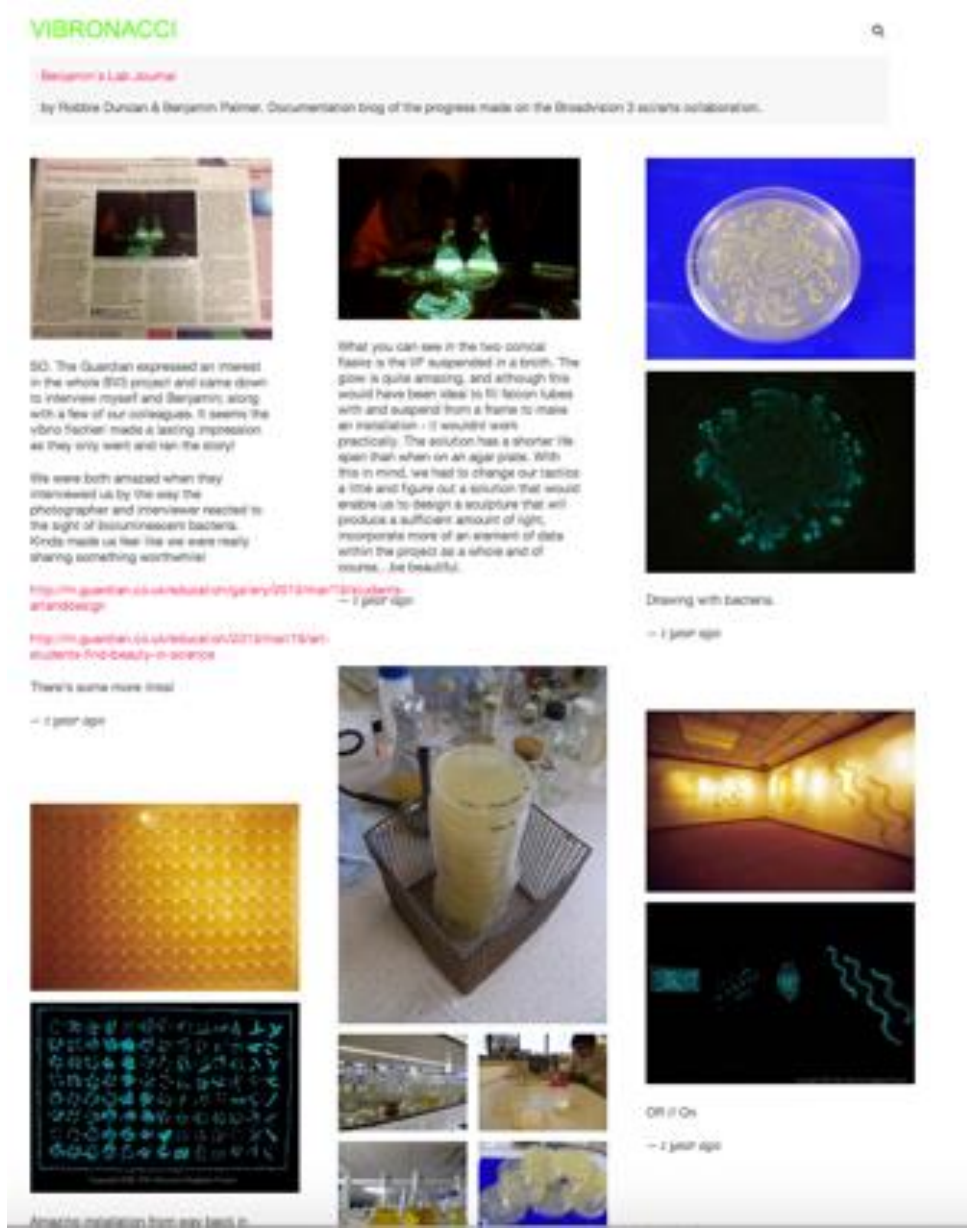
Broad Vision
Art/ Science Research & Learning
at the University of Westminster

*Mateusz Gidaszewski, Charlie Dixon, Camila Gaspa & Shin-Young Choi*



*Benjamin Palmer & Robbie Duncan*

*The Room*
[https://vimeo.com/129451398](https://vimeo.com/129451398)



VIBRONACCI

Benjamin's Lab Journal

by Robbie Duncan & Benjamin Palmer. Documentation blog of the progress made on the Broadvision 3 sci/arts collaboration.

SO. The Guardian expressed an interest in the whole BV3 project and came down to interview myself and Benjamin, along with a few of our colleagues. It seems the vibrio fischeri made a lasting impression as they only went and ran the story!

We were both amazed when they interviewed us by the way the photographer and interviewer reacted to the sight of bioluminescent bacteria. Kinda made us feel like we were really sharing something worthwhile!

There's some more links!

— 1 year ago

What you can see in the two conical flasks is the VF suspended in a broth. The glow is quite amazing, and although this would have been ideal to fill falcon tubes with and suspend from a frame to make an installation - it wouldn't work practically. The solution has a shorter life span than when on an agar plate. With this in mind, we had to change our tactics a little and figure out a solution that would enable us to design a sculpture that will produce a sufficient amount of light, incorporate more of an element of data within the project as a whole and of course... be beautiful.

— 1 year ago

Drawing with bacteria.

— 1 year ago

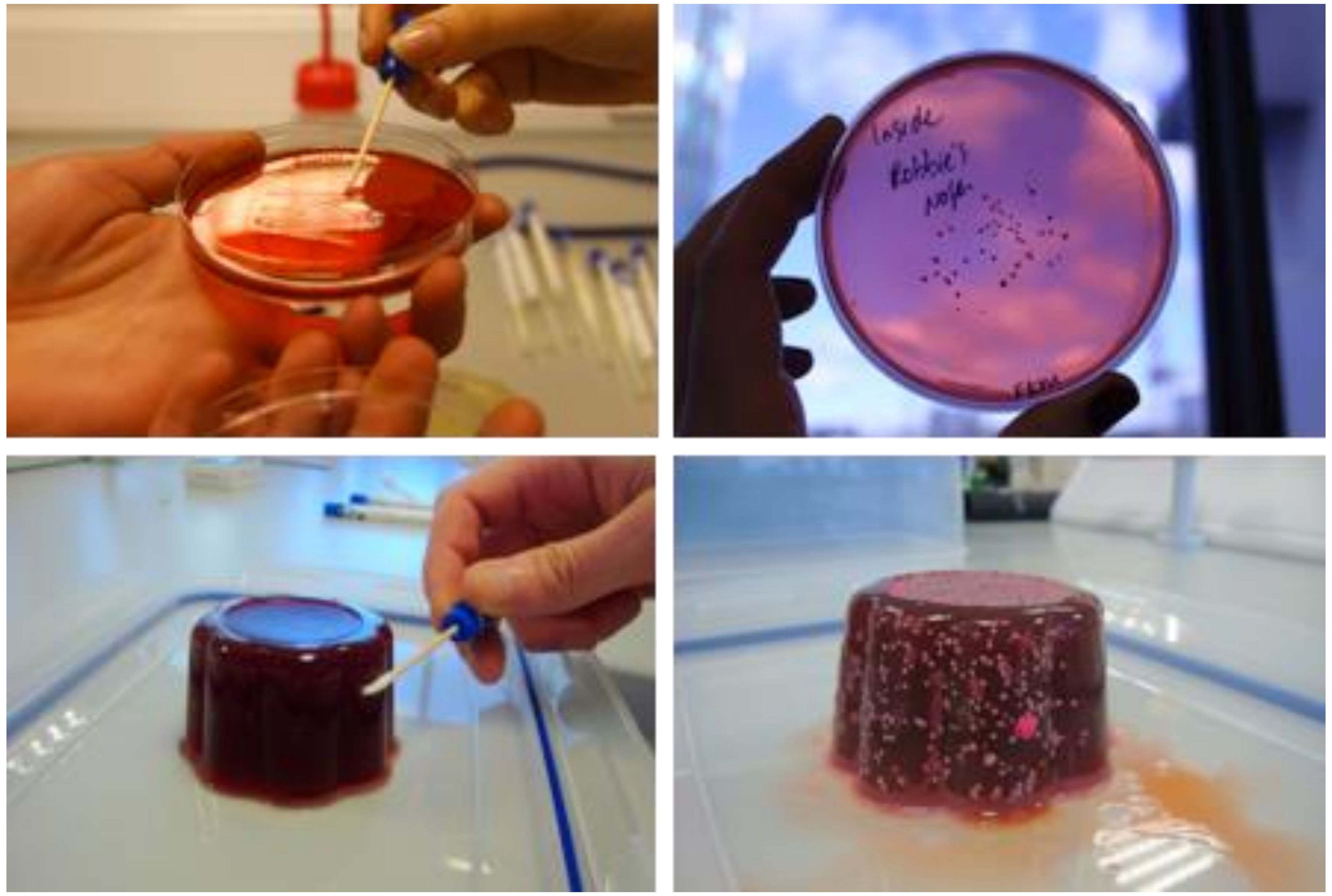
Off // On

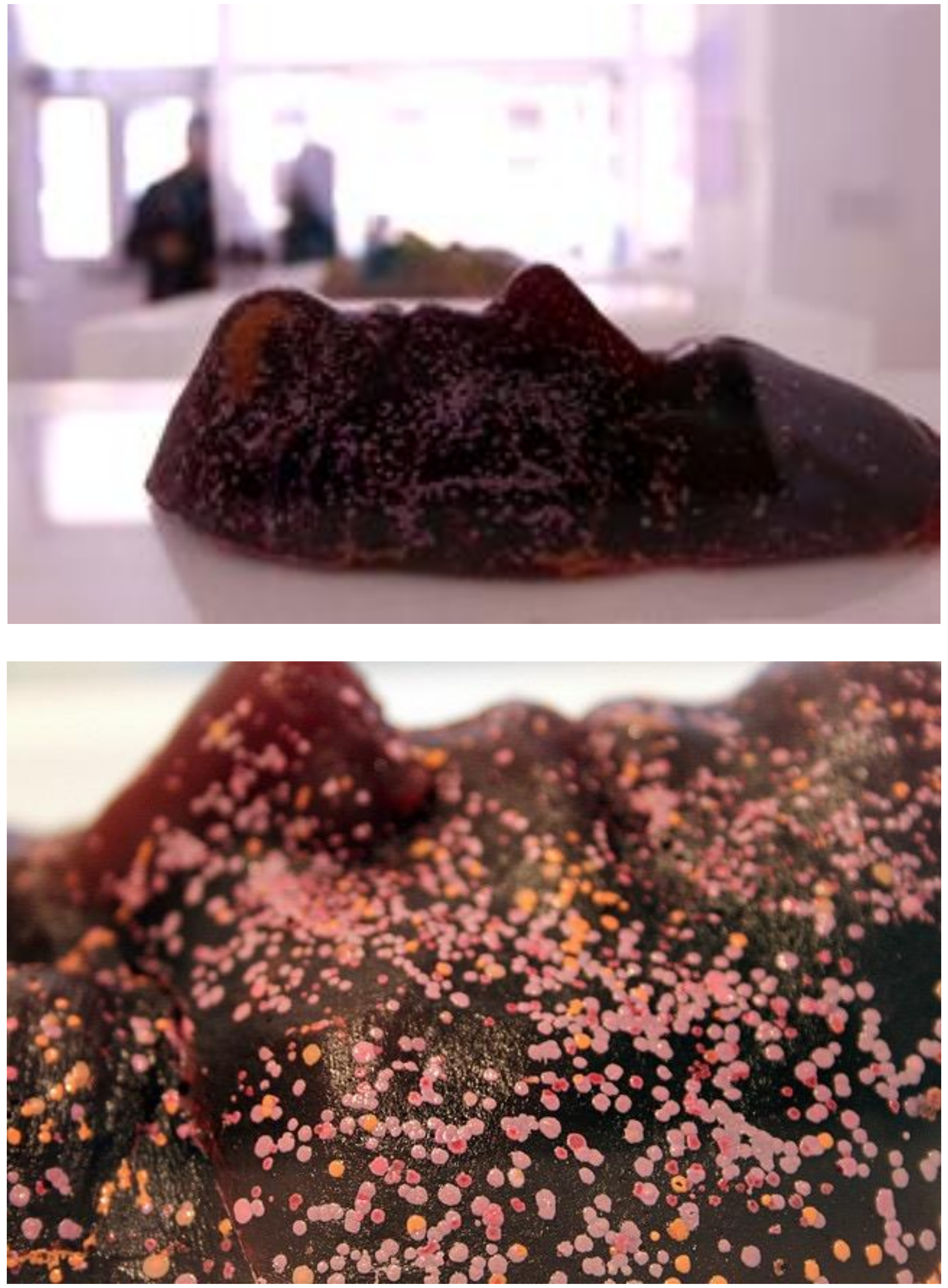
— 1 year ago

broad-vision.info/

# Broad Vision

Art/ Science Research & Learning
at the University of Westminster


Inside
Robbie's
nose



*Mell Fisher, Kitti Edwards &
Freddie Bell*

broad-vision.info/

*Judd Welland, Malgorzata Stasiewicz*
*& JJ Hastings*

*“The great engine of academic creativity is intellectual curiosity - the desire to find out, understand, explain, prove or disprove something or simply to imagine something different”*

*Csikszentmihali, 2008*

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Broad Vision
Art/ Science Research & Learning
at the University of Westminster

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