Translating a SIPSE Experience:

Connecting modern drug discovery to Alabama classrooms
Workshop AGENDA

What is SIPSE? and what is Bioprinting?

Hands-On: Bioinks in the classroom

Next steps and scaling up
Your facilitators

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IB Biology (HL) Year 2
Research Principles,
Physical Science & Science Olympiad
Jefferson County
International Baccalaureate
Irondale, Alabama
- 21 Years, 8 @ JCIB
- NBCT, AYA - Science
- Glad to be back at ASTA

Sonya Edwards

IB Biology (HL), Years 1 & 2
AP Biology & Pre-AP Biology
Department Chair
Ramsay High School
Birmingham, Alabama
- 20 Years in BCS
- BioTeach Facilitator 2009-2017
- First ASTA Presentation!
What is SIPSE?

An 8 - week embed in laboratories at Southern Research

- Collaborate on cutting edge research in STEM
- Design, Execute, and Communicate an independent project
- Weekly meetings with other SIPSE Fellows to brainstorm implementation ideas
What were we hired to do?

Engineer solutions for drug discovery using a new Bio-printer
What did we end up doing?

Developed and tested a viable hydrogel that could become a viable “bioink”.

What are we going to do (first)?

Make a cross-linked hydrogel.

- Use a Sodium Alginate solution mixed with food coloring to make a hydrogel.
- Cross-linked with a CaCl$_2$ solution
- Learn to handle and move spheres
How does this translate into something other than a gimmick?

Hydrogels can encapsulate almost anything...including biological active material!

- We’re going to work with Yeast Derived Catalase
- Can be used with Algae
- Can be used as plant nutrients & in bioremediation
Why Enzymes, and why Yeast?

Yeast in inexpensive, widely available, has a long shelf life and is quite stable.

Enzymes derived from yeast give students lots of opportunity to design experiments and determine the validity of the data they generate.

They are also the underpinning of essential Biological function, tie into NGSS Life Science Core Ideas (LS 1-5,7,6,3) and ACOS 1, 5, and 6
Data Collection 1

An Elegant Experiment

Make several dozen yeast spheres
Remove them from CaCl₂
Rinse them with Distilled water

• Fill a 3 oz cup half way up with 3% H₂O₂
• Drop one yeast sphere into the cup
• Measure and record the time to rise for each sphere
• Upload Data to Google Sheet

Why did this reaction occur?

Catalase + $2\text{H}_2\text{O}_2$ → Catalase-$\text{H}_2\text{O}_2$ complex → Catalase + $2\text{H}_2\text{O}$ + $\text{O}_2$
Data Collection 2

How does substrate concentration influence enzyme reaction rates?

Now that we have established consistent measurements of enzyme activity and have an indirect measurement of product formation...

- How Does changing Substrate Concentration affect enzyme reaction rates?
- Are the changes consistent (do we get “noisy” data, or “clean” data)?

Next steps...

Changing the system

Given the simplicity of this system, and given that environmental conditions affect enzyme function, what are some things we can change about this system?
THANK YOU

Follow up

Don’t hesitate to contact us, follow us on social media and get involved with SIPSE

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