

# NGSS Activities for Teaching Cell Biology

## Summer Workshop Agenda

June 29- July 3, 2020

### Day 1 - Cell Components

Activities:

- Role Playing: Protein Structure and Function
- Model building: Prokaryotic Cells
- Model Building: Eukaryotic Cells
- Simulation: Cell Mobility
- Simulation: Movement in the Endomembrane System
- Lab Skills: Student-designed IB/AP Experiments with Enzymes
- Study Skills: AP/IB Curriculum Changes and Expectations for the AP/IB Exam

### Day 2 - Membrane Traffic

Activities:

- Lab Skills: AP and IB Lab Ideas Related to Diffusion and Osmosis
- Student-designed Inquiry Lab: Factors That Affect Rates of Diffusion
- Model building: Cell Membranes
- Simulation: Passive and Active Transport
- Case Study: Insulin: Homeostasis, Cell Signaling and Endomembrane Transport
- Role Playing: Redox Reactions, Part 1
- Manipulatives: Redox Reactions, Part 2
- Study Skills: Free Response and Short Essay Writing Techniques

### Day 3 - Cellular Energy

Activities:

- Student Modeling: Cell Respiration Processes
- Game: Efficiency of Cell Respiration vs. Fermentation
- Lab Skills: AP and IB Lab Ideas Related to Cell Respiration
- Student-designed Inquiry Lab: Comparing Fermentation Rates in Yeast
- Student-designed Inquiry Lab: Snails and Elodea
- Study Skills: Integrating Scientific Terms into the Working Vocabulary
- Field Trip: Factors That Influence Fermentation, Special Class with a Master Brewer at Hops & Vines

### Day 4 - Photosynthesis

Activities:

- Student-designed Simulation: Photosynthesis
- Lab Skills: AP and IB Lab Ideas Related to Photosynthesis
- Statistical Skills for AP and IB Experimental Analysis
- Debate with a Twist: C3 vs. C4 Photosynthesis Town Hall Meeting
- Wet Lab: Exploring the Factors That Affect Rates of Photosynthesis
- Study Skills: Motivation and Engagement

### Day 5 - Cell Communication and Mitosis

Activities:

- Games: Blood Sugar Game (cell signals and homeostasis)
- Lab Skills: ELISA Test for Antibodies
- Lab Skills: Cell Communication and Division Lab Ideas
- Simulation: Mitosis on a Grander Scale
- Puzzle: The Cell Cycle
- Creating a New Audit Syllabus
- Study Skills: Depth and Detail Expectations of the College Board

# Student-designed Labs and Statistics for AP/IB Science

## Summer Workshop Agenda

### July 13- July 17, 2020

#### Day 1 - Common Statistical Calculations and Parameters

##### Activities:

- Teaching with Games: Statistical Terms Puzzle
- Guiding Student-designed Labs, Step 1: Range of Tolerance Experiments
- Guiding Student-designed Labs, Step 2: Employing the Peer Review Process
- Central Tendency Using Common Parameters: Mean, Variance, Standard Deviation, SEM
- Process of Science: Selecting the Best Graph for Your Data Set
- Special Topic: Unpacking AP and IB Lab Skills, Objectives and Requirements

#### Day 2 - Hypotheses That Compare Data Distilled into Means

##### Activities:

- Process of Science: Writing and Using a Null Hypothesis for Hypothesis Testing
- Student-designed Labs: Reflex Testing for Teaching Student's t-test
- Using Demo Labs as a Springboard to Student-designed Experimentation:
  - Demo Ideas for Labs and Extensions on Labs in Physics and Physical Science
  - Demo Ideas for Labs and Extensions on Labs in Chemistry
  - Demo Ideas for Labs and Extensions on Labs in Environmental Science
  - Demo Ideas for Labs and Extensions on Labs in Biology
- Hypothesis Testing: Data Analysis of Circular Motion Using the Student's t-test
- Special Topic: What do Parameters and Statistics Actually Say about a Research Question?

#### Day 3 – Hypotheses That Compare Observed vs. Expected in Categorical Data

##### Activities:

- Process of Science: How Do We Define What is 'Expected'? Example: % Composition Labs
- Student-designed Labs: Animal Behavior Experiments for Teaching Chi-squared Calculations
- Hypothesis Testing: Using Mitotic Division to Teach the Chi-squared Test
- Using Competition Labs to Elicit Innovation and Refine Techniques: (Perform Secret Example Lab)
- Special Topic: Analyzing and Answering Data-based Questions for AP or IB Exams

#### Day 4 - Hypotheses That Test Correlations Between Two Factors (in the field on this day)

##### Activities:

- Laying the Ground Work for Field Experimentation: Line Transects, Quadrats and Sampling
- Hypothesis Testing: Pearson's Test of Correlation Using Physical Properties Data
- Writing Mathematical Formulas: Modeling Directional Selection and Change Over Time
- Accessing Large Public Data Repositories: Creating Hypothesis Trees and Graphic Analyses
- Special Topic: Error Bars – What Can They Indicate and What Kind Do You Use?

#### Day 5 – Extending Knowledge Beyond Your Classroom

##### Activities:

- Writing Mathematical Formulas to Describe Change: Artificial Selection and Allelic Frequencies
- Vertical Teaming: Creating Departmental Guidelines for Lab Reports, Graphing and Scientific Skills
- Finding and Using Available Supplies: Let What You Have Guide the Investigations You Do
- Covering Content Using Inquiry-based Experimentation: Unpacking and Hitting Standards
- Assessing Skills and Knowledge: Create a Dichotomous Key for Graphing and Analyzing Data
- Special Topic: Classroom Management in a Student-centered Learning Environment

# **Increasing Student Engagement and Critical Thinking**

## **Summer Workshop Agenda**

### **July 20- July 24, 2020**

#### **Day 1 – The Relationship Between Student Engagement and Critical Thinking**

Activities:

- An introduction to student-centered instruction and the flipped classroom
- Student-centered teaching methods and an analysis of the critical thinking required
- Using hooks, phenomena, and other devices to draw students into a topic
- Multi-sensory teaching methods, ideas for stimulating curiosity and recall
- Building an arc of learning within a chapter or a unit

#### **Day 2 – Debates, Research, and Theses: Supporting Claims with Evidence**

Activities:

- Identify the types of evidence used in our subject area and subject area differences of argumentation
- Teaching structures that use argumentation with evidence
- Databases and online resources for primary and secondary sources
- Jigsaw research projects where everyone learns a lot about a little and a little about a lot
- Clarifying goals to sharpen engagement and critical thinking

#### **Day 3 – Puzzle and Games: Using Logic to Guide Independent Reasoning**

Activities:

- Practice several different games that require the use of logic, deductive and inductive reasoning
- Constructing ladders to help students reach the Zone of Proximal Development
- Using two axes organizers as a tool for prewriting
- Irresistible infographics and how to leverage them to practices skills and acquire content
- Each one, teach one in a classroom setting—learn it and pass it on
- The impact of time constraints on engagement and thinking

#### **Day 4 – Models, Reenactments, and Role-plays: Making it Real**

Activities:

- Creating static and dynamic models to put theory into practice
- Simulations and data-generating activities that model dynamic processes
- Using stop-animation videos and narrated descriptions to detail sequenced events
- Scenario projects carried out in an altered reality
- Mocktail parties, Congressional mixers, summits, and symposia--role-playing with a cast of unlikely characters
- Scaffolding autonomy to ensure relevance

#### **Day 5 – Writing Assessments that Foster Continuous Learning**

Activities:

- Activities that prepare students for standardized testing
- Choice menus for autonomy, relevance, and self-direction in learning
- Grant funding competitions, product development awards, and other real life assessments
- Writing a useful rubric
- Using student-designed assessments and self-evaluations as a teaching tools
- The importance of accountability and high expectations

# 2020 Summer Workshops

*Drop the lecture and let the students pick up the learning*

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**Topic:****Dates:****NGSS Activities for Teaching Cell Biology**

June 29-July 3

**Student-designed Labs and Statistics for AP/IB Science**

July 13-July 17

**Increasing Student Engagement and Critical Thinking**

July 20-July 24

**Daily Meeting Times:** Mon-Fri 8am-1pm  
**Location:** Hilton Garden Inn, Asheville, NC**Tuition:** \$550 per workshop  
\*10% discount for multiple faculty from the same school or any person attending multiple workshops**Each Workshop Focuses On:**

- Using hands-on, inquiry-based activities to teach a course at the general, advanced, AP/IB level
- Practicing student-centered learning techniques such as simulations, modeling, debates and games to increase interest and raise the level of critical thinking
- Introducing new ways to motivate and engage students during test taking, essay writing, mastery of study skills, textbook reading, and note taking
- Training teachers to use student-designed lab experiments to teach scientific thinking and prepare for the AP or IB lab requirements (including IAs)
- Helping teachers learn classroom management, testing, and assessment techniques that are experiential
- In-depth review of concept topics to identify areas of weak comprehension and dispel misconceptions (for teachers and students!)

**Additional Information:** All participants will receive 25 hours of Continuing Education Credits and lesson plans covering the week's material in a manner consistent with AP and IB courses.

**Be sure to sign up early, these workshops fill up very quickly.** Please use the order form on the back of this flier or go to [www.CatalystLearningCurricula.com](http://www.CatalystLearningCurricula.com)

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**The Summer Workshop fee is \$550.00 per person for 5 days of training. A non-refundable \$200 place-holding fee is required to secure a spot in each workshop; the balance will be due by June 1, 2020.**

Name of Billing Contact Person:	Name of Attendee:
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**Please indicate which Summer Workshop(s) you plan to attend:**

- NGSS Activities for Teaching Cell Biology** **June 29-July 3**
- Student-designed Labs and Statistics for AP/IB Science** **July 13-July 17**
- Increasing Student Engagement and Critical Thinking** **July 20- July 24**

Sign-up online, or mail this application and a place-holding payment to:  
 Catalyst Learning Curricula, 59 Clemmons St., Asheville NC 28801  
 or email the application to [Kristen.Dotti@CatalystLearningCurricula.com](mailto:Kristen.Dotti@CatalystLearningCurricula.com)

A discount rate of \$149/night Sun-Thu has been arranged for participants who choose to stay at the Hilton Garden Inn where the workshops will be held each day (use the link at the Catalyst Learning Curricula website). Accommodations and transportation must be arranged by the attendee.