

# Create Engaging Lessons with DE Science Techbook

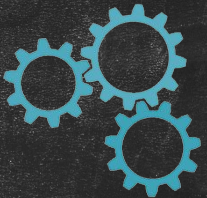
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[goo.gl/VcBBXJ](https://goo.gl/VcBBXJ)





What is your definition of student engagement?



“...the student's level of **investment in learning**; it includes being thoughtful and purposeful in the approach to school tasks ...”

-Fredricks, Blumenfeld, and Paris 2004

# Overview: What's in a Techbook?

- Standards-Based Lesson Plans
- Hands-On Labs & Activities
- Interactive Text
- Reading Passages
- STEM Project Ideas
- Pre-Made Assignments
- Custom Assessments
- Videos
- Pre-Made Assessments
- Virtual Labs

**More than enough to keep students interested and engaged!**


# What's in a Techbook?

## Biology (NEW)

Switch Course ▾ What's New? Standards ▾ Interactive Glossary

COURSE VIEW TABLE OF CONTENTS

Expand All  Collapse All



**Introduction to Biology**

UNIT: **Process of Science** ▾

CONCEPT: **Using Scientific Methods**

**Measurement**

**Conversions**

**Laboratory Practices and Safety**

UNIT: **The Building Blocks of Life** ▾

CONCEPT: **Atoms, Elements, Compounds, and Chemical Bonds**

**Chemical Reactions**

**Cells and Heredity**

UNIT: **Cells** ▾

CONCEPT: **Cell Structure and Function**

**Cell Transport**

**Cell Division**

**Asexual and Sexual Reproduction**

**Cellular Respiration**

**Photosynthesis**

UNIT: **Heredity** ▾

CONCEPT: **Genetics**

**Living Things**

UNIT: **Diversity of Life** ▾

CONCEPT: **Classification**

**The History of Life on Earth**

**Evolution**

**Viruses**

UNIT: **Plants** ▾

CONCEPT: **Plant Form and Function**

**Plant Reproduction**

UNIT: **Animals** ▾

# What's in a Techbook?

## Atoms, Elements, Compounds, and Chemical Bonds

Engage

Explore

Explain

Elaborate with STEM

Evaluate

Model Lesson

### Thinking about Atoms, Elements, Compounds, and Chemical Bonds

Take a moment to close your eyes. Picture all the living and nonliving things around you. Choose one thing with which you often interact. Now visualize something that is the exact opposite with regard to sight, smell, behavior, and any other properties you can think of.

All living and nonliving things are made of matter, and all matter is made of atoms.



**5E  
Lesson  
Model**

# What's in a Techbook?

## Atoms, Elements, Compounds, and Chemical Bonds

Engage Explore Explain Elaborate with STEM Evaluate Model Lesson

### Learning Standards

Lesson Overview

Teacher Preparation

Materials to Prepare

Sessions 1 — 3

Session 4

Session 5

Sessions 6 — 8

Assignments and Resources

### Learning Standards

North Carolina >> Essential Standards >> Science >> 2010

- NCES.Bio.4.1 - Understand how biological molecules are essential to the survival of living organisms.

Lesson Overview

Teacher Preparation

Materials to Prepare

### Sessions 1 — 3

Session 4

Session 5

Sessions 6 — 8

Assignments and Resources

### Sessions 1 — 3

#### ENGAGE (20 minutes)

#### Activate Prior Knowledge

Provide students with images of living and nonliving things, such as [Water Droplet](#), [Lava Cooling](#), [Poinsettia Plant](#), and [Children Together in Kenya](#). Try to use images of nonliving things that show action. Have students work in pairs to classify the images into categories.

Have student pairs share their classifications. Elicit from students that the pictures can be divided into living and nonliving things. Have student pairs work together to answer the following questions in their notes, and then discuss answers as a class:

- *What are characteristics of living things?*(complex organization, metabolism, responsiveness, movement, growth, reproduction, evolution)

Step-by-Step Lesson Plans

Standards Aligned Lessons

# What's in a Techbook?

## Cell Division

Prokaryotes  Eukaryotes

Select the action the cell must perform to continue the cell cycle.

Chromosome Duplication

Cell Division

Cell Growth

Start Over

Reset



That's right. The daughter cells are healthy and can begin a new cell cycle. You can use the Start Over button to start the process of cell division with a new cell in a different stage of the cell cycle.

### The Cell Cycle

A prokaryotic cell is a simple nucleated cell while a eukaryotic cell is complex and nucleated. A prokaryotic cell, like a bacterium, uses the mechanism of binary fission for division. In this, the bacterium copies its single chromosome. As the cell grows, the two copies of the chromosome separate. The cell then divides into two.

A eukaryotic cell goes through a period of growth and division. Chromosome duplication takes place in the S phase. The phase that follows S phase is called G2, or phase 2. This is followed by the M phase. This phase includes the processes of mitosis and cytokinesis. Mitosis is divided into five stages: prophase, prometaphase, metaphase, anaphase, and telophase. At the end of telophase, the parent cell forms two daughter cells. These cells are in the G1 phase and are ready to repeat the cycle.

that match damaged ones. In some organisms, mitosis can lead to the regrowth or regeneration of body parts. For example, some lizards and amphibians can regrow severed tails or limbs. Scientists are studying the mechanisms by which animals regenerate body parts, hoping to one day allow the same type of regrowth in humans.

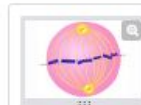


### Bone Regeneration

A man receives a new thumb thanks to breakthroughs in tissue regeneration research. What role did mitosis play in this tissue regeneration?

### Mitosis

The cell cycle is responsible for the reproduction of cells in the body. Place the steps of the cell cycle in order.



1.



2.



3.

Virtual Labs/Explorations

Interactive Text

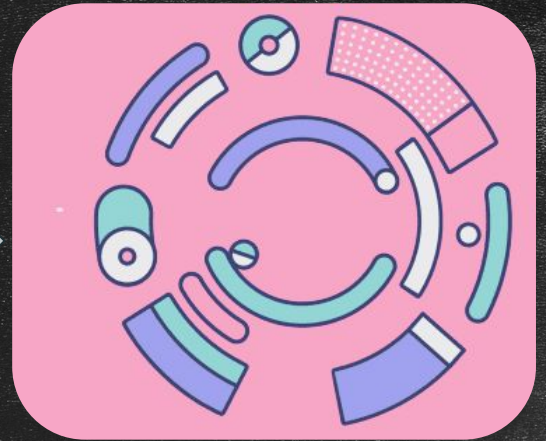
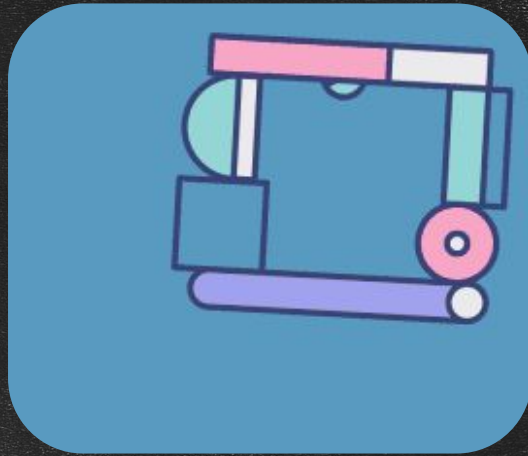


# Tips, Tools, and Strategies



Think Outside of

# Tip : Redesign the Box



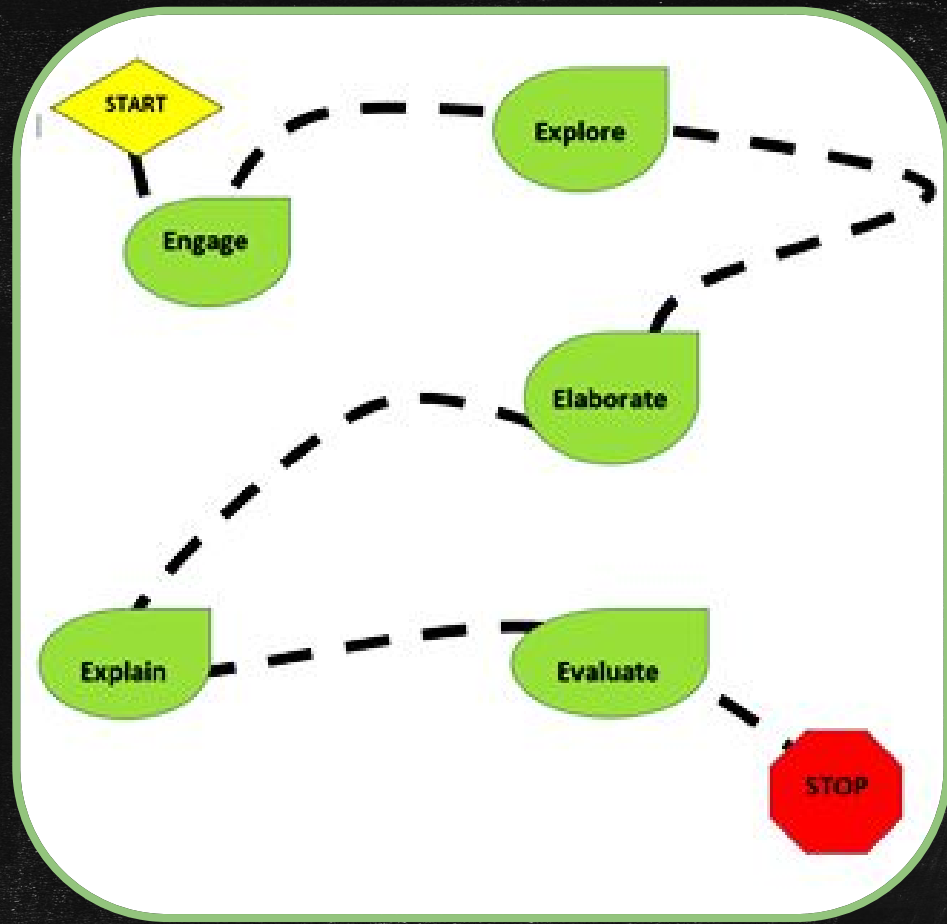
**Tip:**  
Purposefully plan  
your lesson

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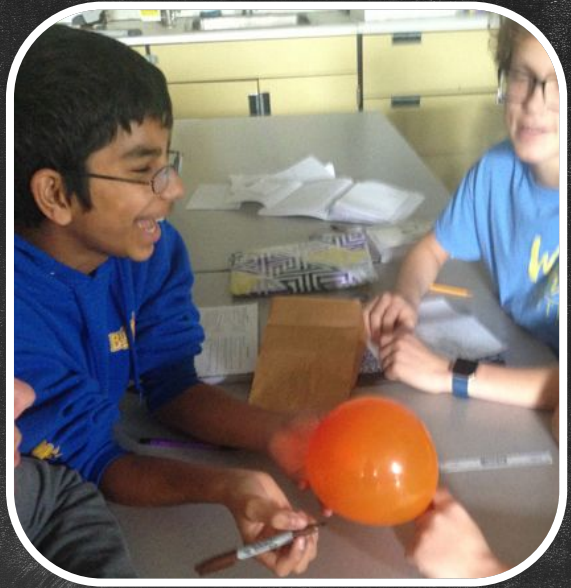
**Ask Yourself:**

Q: What do students need to know by the end of the lesson?

Q: What reinforcement activities will I use to explore, elaborate, and explain a topic?



**Tool:**  
Content  
Reinforcement  
Activities



What are content  
reinforcement  
activities?

---

Strategies that help  
strengthen and support  
student understanding  
after the core learning  
content has been  
delivered.

# Strategy: Create a Timeline

## Example #1: 90 Minute Class

**5 minute Bellwork** (Ask content related question)

**20 minute** Content introduction from the teacher

**10 minute** Video to reinforce direct instruction

**25 minute** Group Work or Independent Learning Activity

**30 minute** Group Work or Independent Learning Activity

**5 minute** Exit work or class discussion



# Strategy: Create a Timeline

## **Example #2: 50 Minute Class**

**5 minute** Bellwork (Ask a content related question)

**15 minute** Content introduction from the teacher

**25 minute** Group Work or Independent Learning Activity

**5 minute** Group Work or Independent Learning Activity

# Techbook Tools

Build assignments, writing prompts, digital posters, assessments, and interactive quizzes...

## My Builder Tools



### Assignment Builder

Build and store assignments for your students that use Discovery Education curriculum content.

- ▶ My Assignments
- ▶ Create New Assignment



### Assessment Manager

Build formative assessments and view their results by class or by student.

- ▶ My Assessments
- ▶ Create Standards-Based Assessment
- ▶ Create Concept-Based Assessment
- ▶ Create Custom Assessment



### Board Builder

Create a fun, engaging, digital project with any content using board builder.

- ▶ My Boards
- ▶ Create New Board



### Writing Prompt Builder

Give students writing practice with these images that include composition prompts.

- ▶ My Writing Prompts



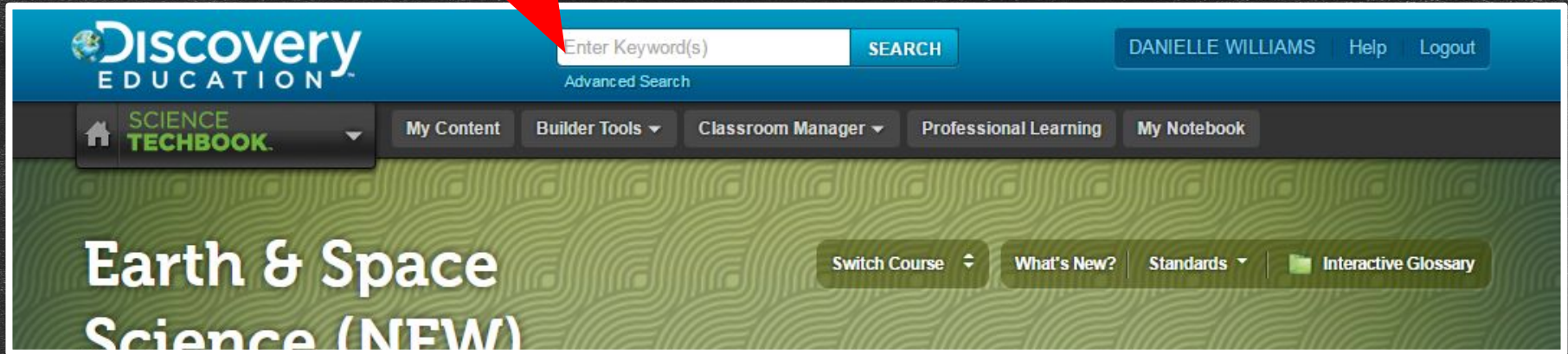
### Quiz Builder

Incorporate video clips into interactive quizzes with Discovery Education Quiz Builder.

- ▶ My Quizzes

# Tip: Quick Start with Techbook

Use the search bar to find a concept that you teach



The screenshot shows the Discovery Education website interface. At the top left is the Discovery Education logo. To its right is a search bar with the placeholder text "Enter Keyword(s)" and a "SEARCH" button. Below the search bar is a link for "Advanced Search". In the top right corner, the user name "DANIELLE WILLIAMS" is displayed, along with "Help" and "Logout" links. Below the search bar is a navigation bar with a home icon and "SCIENCE TECHBOOK." dropdown menu, followed by buttons for "My Content", "Builder Tools", "Classroom Manager", "Professional Learning", and "My Notebook". The main content area has a green background with a topographic map pattern. On the left, it says "Earth & Space Science (NEW)". On the right, there are buttons for "Switch Course", "What's New?", "Standards", and "Interactive Glossary". A red arrow points from the text above to the search bar.



# Techbook Tools

Search for:

Videos, Boards, Images, Audio, Text, Interactive Resources

The screenshot shows a search results page for 'Techbook Tools' with 16 results for 'Interactive' resources. The page is organized into a grid of resource cards, each with a thumbnail image, a title, a description, and a grade level.

**Filters:**

- TYPE:**
  - Exploration
  - Interactive Video
  - Science Tool
- DETAILS:**
  - Teacher's Guide
- LANGUAGE:**
  - English
- COPYRIGHT:**
  - 2008 or newer
  - 2002-2007
  - 2001 or earlier

**Search Results:**

- 16 results**
- Interactive Video:**
  - The Periodic Table of Elements**  
Everything that you see around you is made from just the elements in the periodic table. Find out why chemistry is more about electrons than anything else.  
Grade(s) 6-8
- Science Tool:**
  - The Interactive Periodic Table**  
Learn about the properties of every element in the periodic table, as well as every element family, through this vast collection of video segments. Watch chemistry come to...  
Grade(s) 6-8, 9-12
- Exploration:**
  - Atoms, Elements, Compounds, and Chemical Bonds**  
All substances are made up of molecules of elements. The atoms of these elements combine in specific ratios to form the molecule. In this Exploration, you will form molecules...  
Grade(s) 9-12 Related Materials
- Exploration:**
  - Build Your Own Atom**  
Construct an atom based on a mass number and atomic number.  
Grade(s) K-2, 3-5, 6-8, 9-12 Editable
- Exploration:**
  - Periodic Trends**  
The trends in a periodic table of elements depend on the arrangement of elements in the table. Use this Exploration to...
- Exploration:**
  - Chemical Properties**  
Chemical properties like electronegativity, ionization potential, and atomic radius determine the behavior of the elements. In...
- Exploration:**
  - Parts of the Atom**  
Atoms are the basis of everything in the universe. An atom is a unit of matter, the smallest unit of an element...
- Exploration:**
  - Lewis Structures and Molecular Geometry**  
Lewis structures are diagrammatic representations of compounds. In this Exploration, create the Lewis structures...

# Increase Student Engagement

## Tool: Board Builder

Students work individually and/or collaboratively to create digital posters for projects.

The screenshot shows a digital board builder interface with a light blue background. At the top, a yellow arrow-shaped banner points to the right and contains the text "Dew Point". Below this banner are four content areas:

- Top Left:** A video player showing a cloudy sky with a play button in the center. Below it is the text: "The temperature at which the air becomes saturated is called the dew point."
- Top Right:** A weather icon showing a sun, a cloud, and a red location pin over a green field, with a play button in the center. Below it is the text: "Weather includes air temperature, winds, humidity, dew point, and precipitation."
- Center:** A yellow sticky note with a white border and a shadow. It contains the text: "Dew Point is the temperature to which air must be cooled in order to reach saturation. After air is cooled enough to reach 100% saturation".
- Bottom Left:** A digital notebook icon with a green cover and a white page showing "5F". Below it is the text: "In the text reading it explains what the dew point is and the process to get there."
- Bottom Right:** A digital notebook icon with a green cover and a white page showing "5F". Below it is the text: "This text helps you understand weather and the different phases and patterns about it."

At the bottom of the interface, there is a horizontal scroll bar and a small blue bar.

# Tool: Board Builder



Group presentations using DE Board Builder

# Increase Student Engagement

Discovery<sup>VR</sup>



## LET'S GO PLACES: FLORIDA



Tool: Discovery VR  
(Virtual Reality)



# Increase Student Engagement



## Go Fly a Kite

**Interviewer:** Thank you for joining us, Dr. Aoelus. Our focus on this program has been the causes of weather. Today we're discussing wind. Hopefully you can help clarify all those terms that meteorologists use in their weather forecasts—like "high-pressure area" and "Coriolis effect"!

**Dr. Aoelus:** Thanks for inviting me. Wind is a fascinating subject, especially in the spring, when our thoughts turn to kite flying and getting the sailboats ready for summer.

**Interviewer:** What causes wind, anyhow?

**Dr. Aoelus:** That's a simple question with a complicated answer. Simply put, wind is the movement of air. To understand why the air moves, though, we need to understand a bit of Earth science. Wind is caused by differences in air pressure. Think about what happens if you blow up and tie a balloon. The pressure inside the balloon is greater than the pressure outside the balloon, but the tied balloon keeps the air inside. But what happens if you untie the balloon? The air inside can escape through the opening. It moves in a whoosh from an area of higher pressure to an area of lower pressure.

**Interviewer:** I see, but what causes differences in air pressure in our atmosphere?

**Dr. Aoelus:** Basically, they're caused by changes in temperature. Because different parts of Earth receive different amounts of solar radiation throughout the year, atmospheric temperatures are continuously changing. During the summer, the air in a region is generally warmer than during the winter. The same is true of the day compared to the night. As the



Weather isn't the only thing on Earth affected by winds. These dandelions depend on the wind to spread their seeds around the globe.

## Tool: Green Screen using DE Reading Passage



# Increase Student Engagement

## DE Virtual Field Trips



In this Virtual Field Trip, Discovery Education and National FFA will transport you to the Carroll Innovation Center in Wichita, Kansas for an inside look at how a diverse range of agriculture careers work together to ensure safe and affordable food production across the globe.

[Watch Now](#)



### AgExplorer: Behind The Scenes at Ford Motor Company

Join National FFA and Discovery Education as they take you behind-the-scenes at Ford Motor Company in Dearborn, MI, to learn how the needs of agriculture customers impact the design, engineering and testing of Ford F-Series trucks. Meet Ford employees who use advanced technologies to solve the practical challenges faced daily in agricultural settings.

[Watch Now](#)



Celebrate Space Week with your students by introducing them to the latest in space exploration technology and meet the team of STEM professionals designing missions to an asteroid, Jupiter, and Mars. Don't miss this exciting opportunity to connect STEM concepts with real world applications and inspire the next generation of space engineers. Register TODAY for the Generation Beyond Virtual Field Trip.

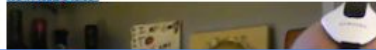
[Watch Now](#)



### Manufacture Your Future: Alcoa Kitts Green

Take a tour of the Alcoa Kitts Green Manufacturing Plant in Birmingham, UK to find out about the processes behind the manufacturing of aluminum. Apprentices at the plant will also share more about the careers opportunities in manufacturing.

[Watch Archive](#)



### National Energy Star Day

Watch the archive event with Discovery Education, EPA Administrator Gina McCarthy, and our special guest students to learn about the importance of energy efficiency and how our energy use affects climate change. See cool experiments about the science behind energy and explore how innovative products make it easier for us to save energy and protect the environment.

[Watch Archive](#)



### KILIMA

expo

Discovering



### Celebrate Pi Day with Discovery Education and NIST

Tour inside the National Institute of Standards and Technology (NIST) and meet the mathematicians and scientists doing cutting-edge research on problems worth solving.

[Watch Archive](#)



### Dig Into Mining: Metals in Everyday Life

Get a behind-the-scenes look at a working copper mine where students will see a Geologist and Mine Planning Engineer showcase real-world examples of how STEM is used in the work place.

[Watch Archive](#)



### A Virtual Field Trip From the Museum of Science

Join us from the Museum of Science in Boston, one of our nation's premiere informal learning institutions, as we explore the natural and human-made world through the lens of engineering. We'll be visiting STEMastic exhibits like a Van de Graaff generator, a machine that makes musical thunder and lightning.

[Watch Archive](#)



### A Behind the Scenes Look at the Discovery Channel Telescope

Share with your students an exclusive tour behind the \$53 million facility that encapsulates the 4.3 meter Discovery Channel Telescope (DCT). In addition to the breathtaking images that the DCT has captured in its short life, we'll review the engineering and architectural challenges that were conquered to sustain such an amazing undertaking.

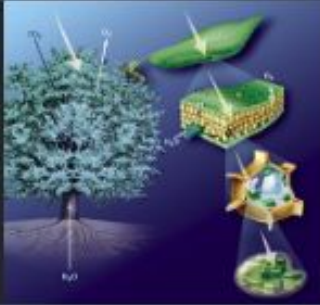
[Watch Archive](#)



# Differentiate Learning



## STEM Project Starters



### Mimicking Photosynthesis

How can photosynthesis be performed in a laboratory?



### Modeling Carbon Storage through Photosynthesis

How does photosynthesis lead to carbon storage in forests?



### Fertilizers and Plant Growth

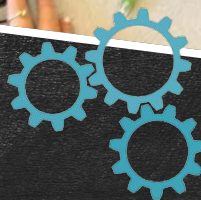
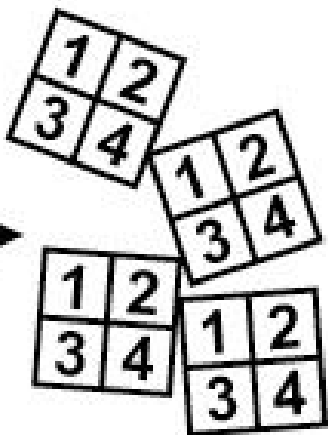
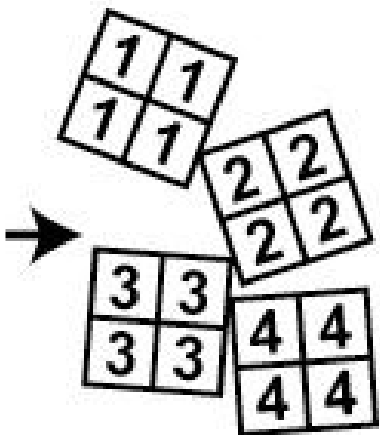
How do fertilizers affect aquatic plants?

# Student Collaboration & Differentiation

## Strategy: Jigsaw

EXPERT TEAMS

HOME TEAMS





# Increase Student Collaboration

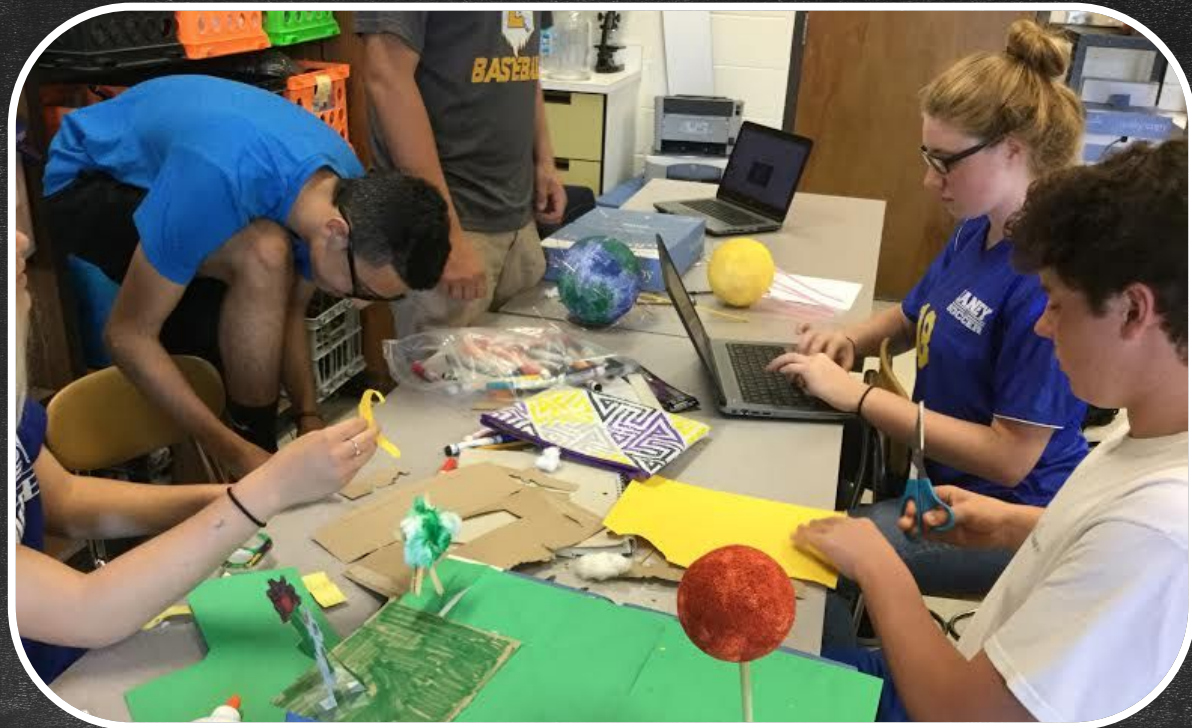
Large Group Presentations

Small Group Presentations



# Increase Student Collaboration

## Group Projects



# Increase Student Collaboration



## Group Competitions



### Student Engineering Design Sheet

- What is the problem you are trying to solve?
- What are some initial ideas on how to solve the problem?
- Which of the proposed solutions deserve further investigation?

Define the Problem

Develop Solutions

- How will you construct and test your proposed solution?
- What were the results of your multiple tests?

Optimize Design

- What changes will you make to your proposed solution, as a result of your tests?
- What new tests will you conduct to optimize your proposed solution?
- What is your final proposed solution to the problem?



# Assessment

Use data from Discovery Education assessments to inform future instruction. (Ex: move on or remediate)

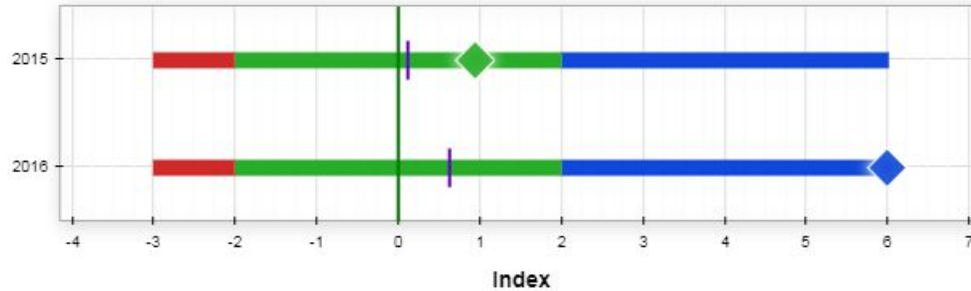
Class: 3rd Block EE    Assessment: Energy Transfer    Attempt: 1

Item Report    Student Score    Mastery Graph

Question	Performance Ratio	Students that Received Question	By Item				Assign Remediation Materials UNCHECK ALL
			A	B	C	D	
<p>How does heat energy move by convection when a cook heats a pot of water?</p> <p>A) Heat energy moves from the air into particles of water that are touching air.</p> <p><b>B) Particles at the bottom of the water carry heat energy to the top of the water.</b></p> <p>C) Heat energy moves from the bottom of the pot into nearby particles of water.</p> <p>D) Particles from the water carry heat energy to the particles of air over the water.</p>	80.0%	20	0	16	1	3	<input checked="" type="checkbox"/>
<p>What provides protection from harmful solar radiation and maintains the proper conditions for life on Earth?</p> <p>A) Earth's ocean</p> <p>B) Earth's convection</p> <p>C) Earth's troposphere</p> <p><b>D) Earth's magnetic field</b></p>	95.0%	20	0	0	1	19	<input checked="" type="checkbox"/>
<p>How do biologists associate Earth's magnetic field with the evolution of life on the planet?</p> <p>A) The magnetic field maintained greenhouse gas levels that maintained the planet's temperature.</p> <p><b>B) The magnetic field allowed charged particles that could benefit</b></p>	55.0%	20	3	1	5	11	<input checked="" type="checkbox"/>

# Student Achievement

When properly implemented, increased student engagement can also increase student achievement.



Teacher Growth Measures and Standard Errors				
Year	Growth Measure	Standard Error	Index	Level
2015	0.4	0.4	0.95	Meets Expected Growth
2016	2.6	0.4	5.99	Exceeds Expected Growth

# Additional Resources



Grab Bag of Resources

  
**SOS**  
 Hundreds Chart

It's time to celebrate! Our first 100 instructional strategies are all just one click away.  
 (How nice would it be to work energy with classroom discussion? To sign in to find the link on the link.)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Thank you to Carol Anne Heacock for providing the celebration!

100 DE Strategies (SOS)

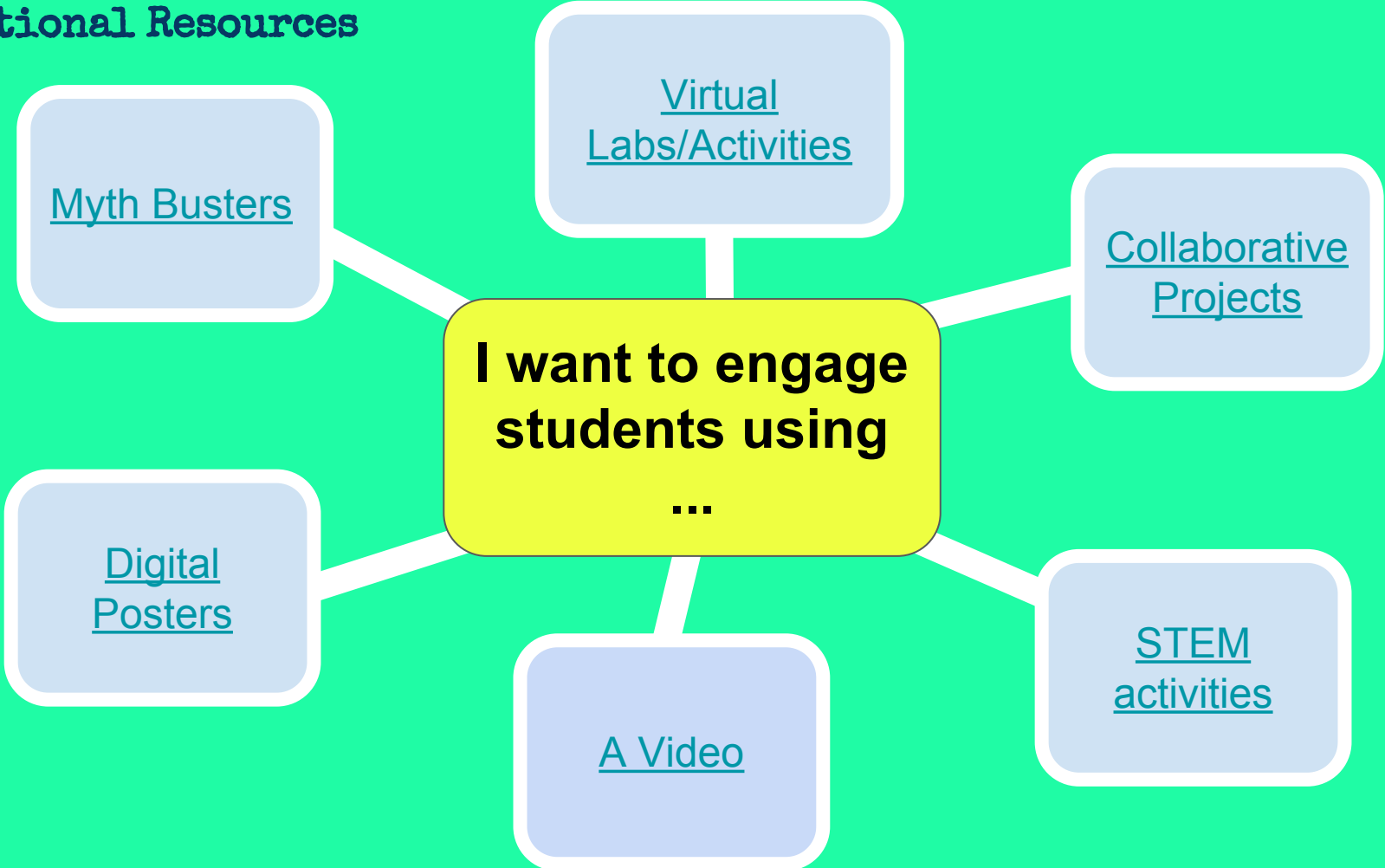
Discovery Education's  
**PUZZLEMAKER**

DE Puzzlemaker



Template for Engaging Lesson Plan

# Additional Resources



**I want to engage students using**  
...

Myth Busters

Virtual Labs/Activities

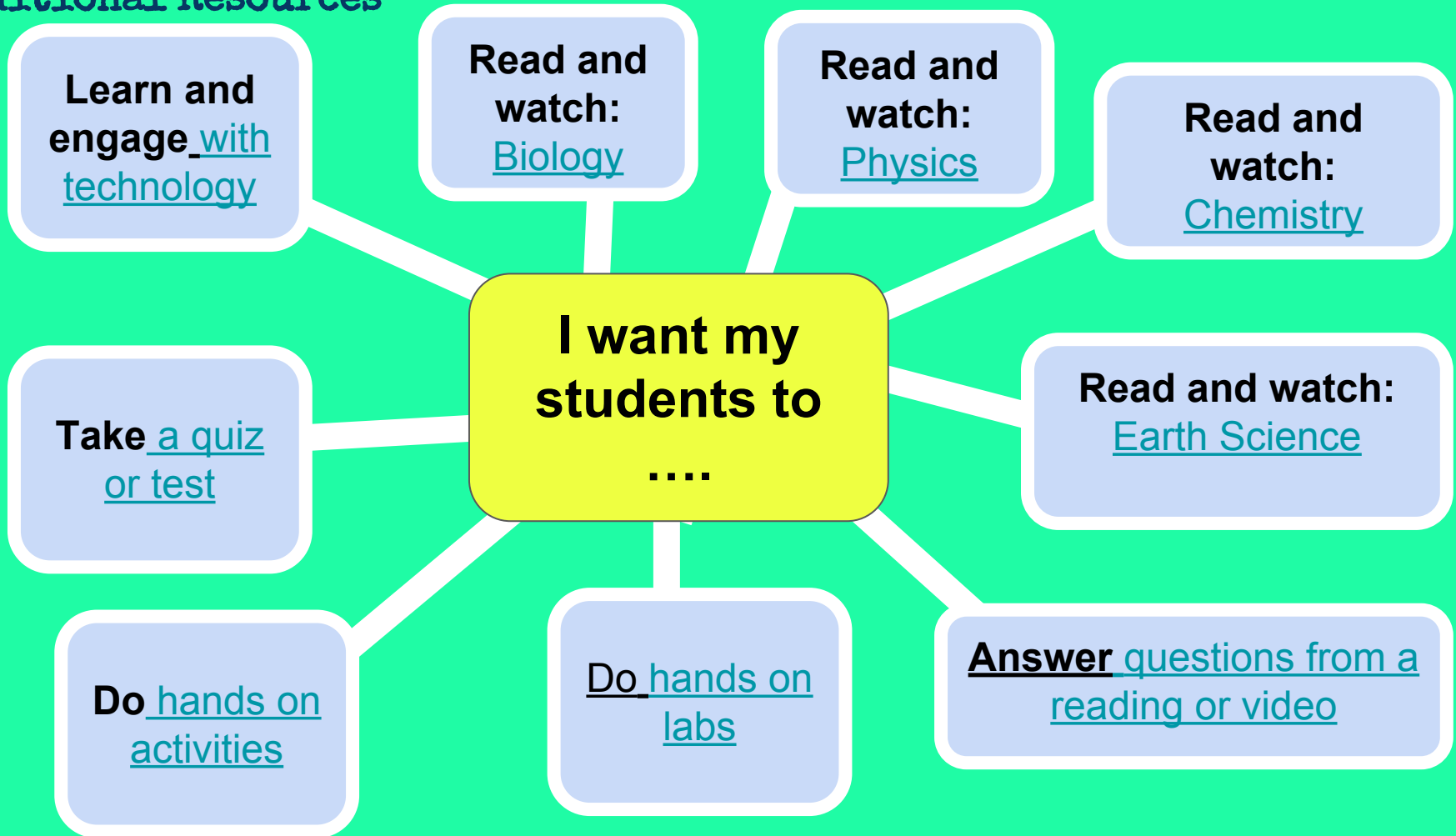
Collaborative Projects

STEM activities

A Video

Digital Posters

## Additional Resources







# Reflection

1. Did anyone fully plan a lesson?
2. What resource did you like the most? Do you have a go-to resource that we should add to the grab bag?
3. Any final thoughts or ideas about engaging students?



# THANK YOU



**Danielle Williams**

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