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Breaking Science Silos

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Objectives

- Explore integrative models as they relate to content and skill standards
- Reflect on how to engage students in real-world applications of scientific concepts
- Identify and adapt integrative techniques to individual curricula and classroom environments

Integrative learning experiences are those which forge meaningful connections of concepts, constructs, and principles within and across academic subjects and real-world situations.

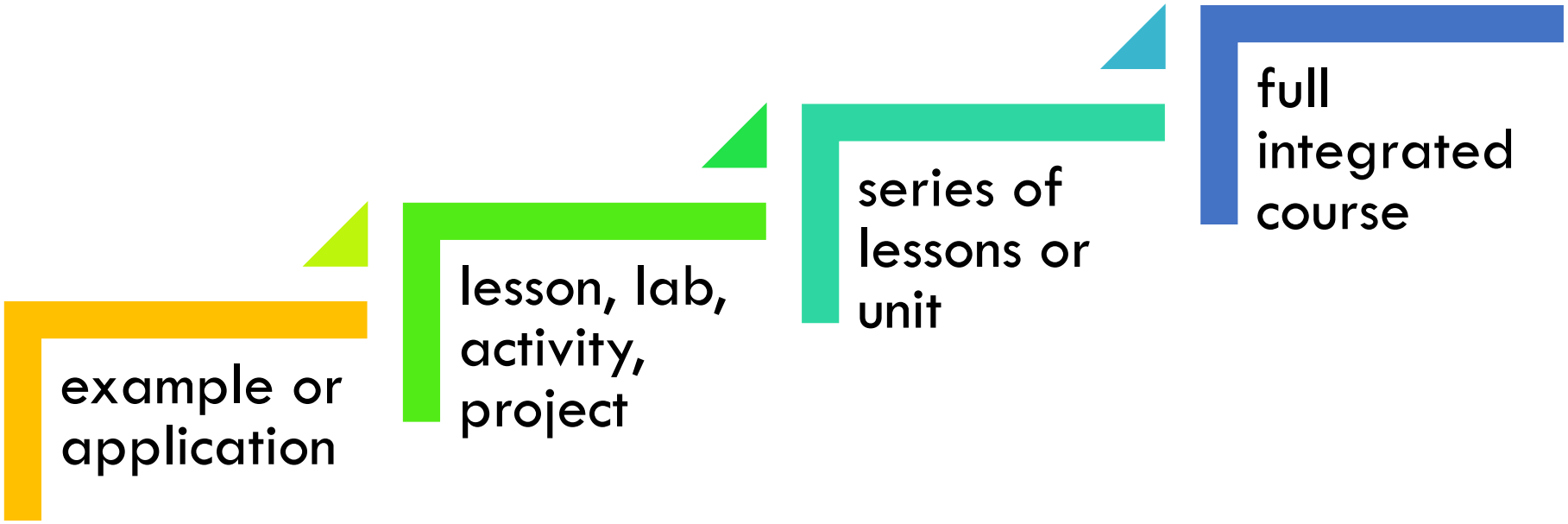
Instrumental vs. Relational Understanding

Card Sort Activity

Why Integrative?

- Single lens approaches can limit students from making connections
- Integrative learning experiences help increase understanding, retention, and application of concepts as well as critical thinking and problem solving skills
- So how do we build it in?

Tiers of Integrative Learning



Some Integrative Topics

Properties of Matter, Gases, Density	Lungs and respiration, altitude cooking, flight
Properties of Waves	Soundwaves: music & mood and soundtrack choices
Properties of Water	Water safety, marine health
Kinetic energy, phase changes, heat transfer	Road salt & environmental impact
Hydrophobic and hydrophilic interactions	Efficacy of different cleaners on various dyes, stains
Engineering design	Biomimicry - wing shape, swimsuit material, waterproofing…

Use current events, case studies, news to integrate content

"when are we ever going to use this?"

Baby oysters can't build healthy shells in Washington's acidified waters

Oysters are one of the iconic foods of the Pacific Northwest. But their survival is under serious threat thanks to ocean acidification, sometimes called the "evil twin" of climate change.

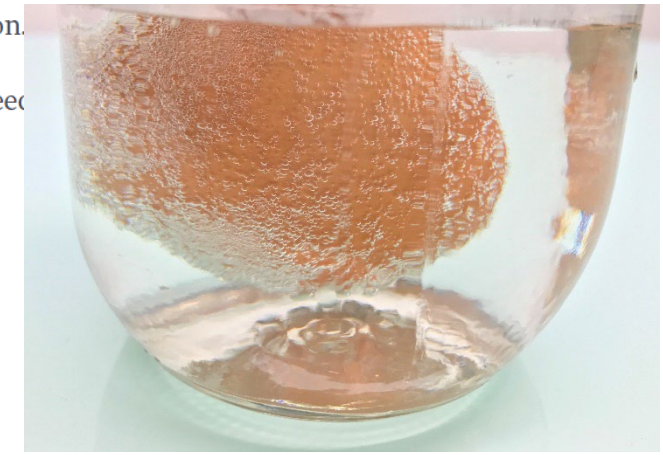
Local shellfish growers are seeing the devastating impacts on oysters and other shellfish.

Since 1989, the hatchery at Taylor Shellfish has grown billions and billions of oyster larvae. Like any other farm, it's had its share of failures — times when large numbers of oysters would die for an unknown reason. But things usually bounced back.

Then, in the 2007-2008 season, those failures became the norm.

"We didn't have any oyster larvae," recalled Bill Dewey, the company's director of public affairs. "Our production was down by about 75 percent."

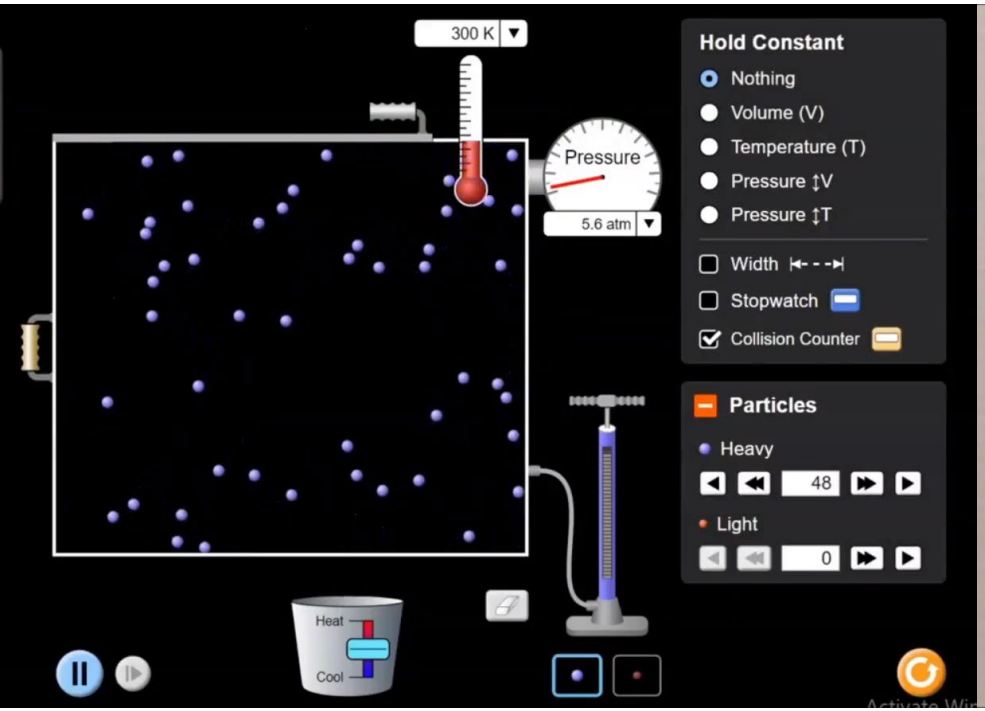
Soon, they learned that other growers on the West Coast were having the same problem. Dewey said they knew something serious was going on.

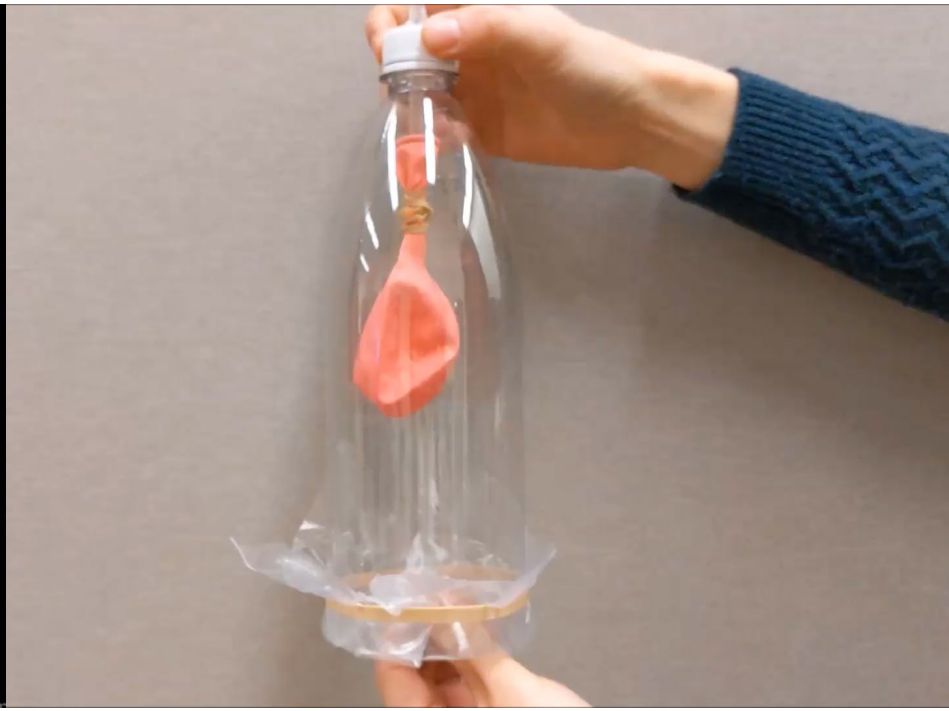


"We had an oyster seed crisis. There was no seed in the 2008-2009 time frame," he said.

Structure integrative lesson as an inquiry or problem centered learning experience

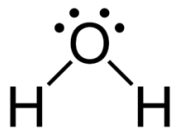
Students make observations, gather data/evidence, make sense of and apply knowledge to new situation

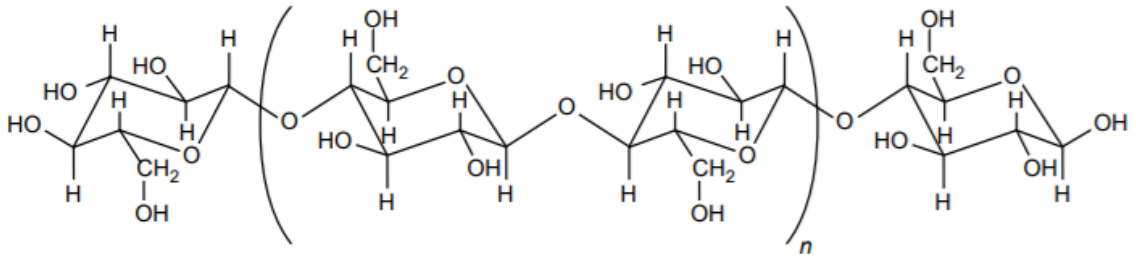

300 K
Pressure
5.6 atm
Hold Constant
Nothing
Volume (V)
Temperature (T)
Pressure ↕V
Pressure ↕T
Width
Stopwatch
Collision Counter
Particles
Heavy
48
Light
0
Heat
Cool



Connect the familiar with the abstract

Explore science concepts with safe and accessible materials. Scaffold focus questions as appropriate.

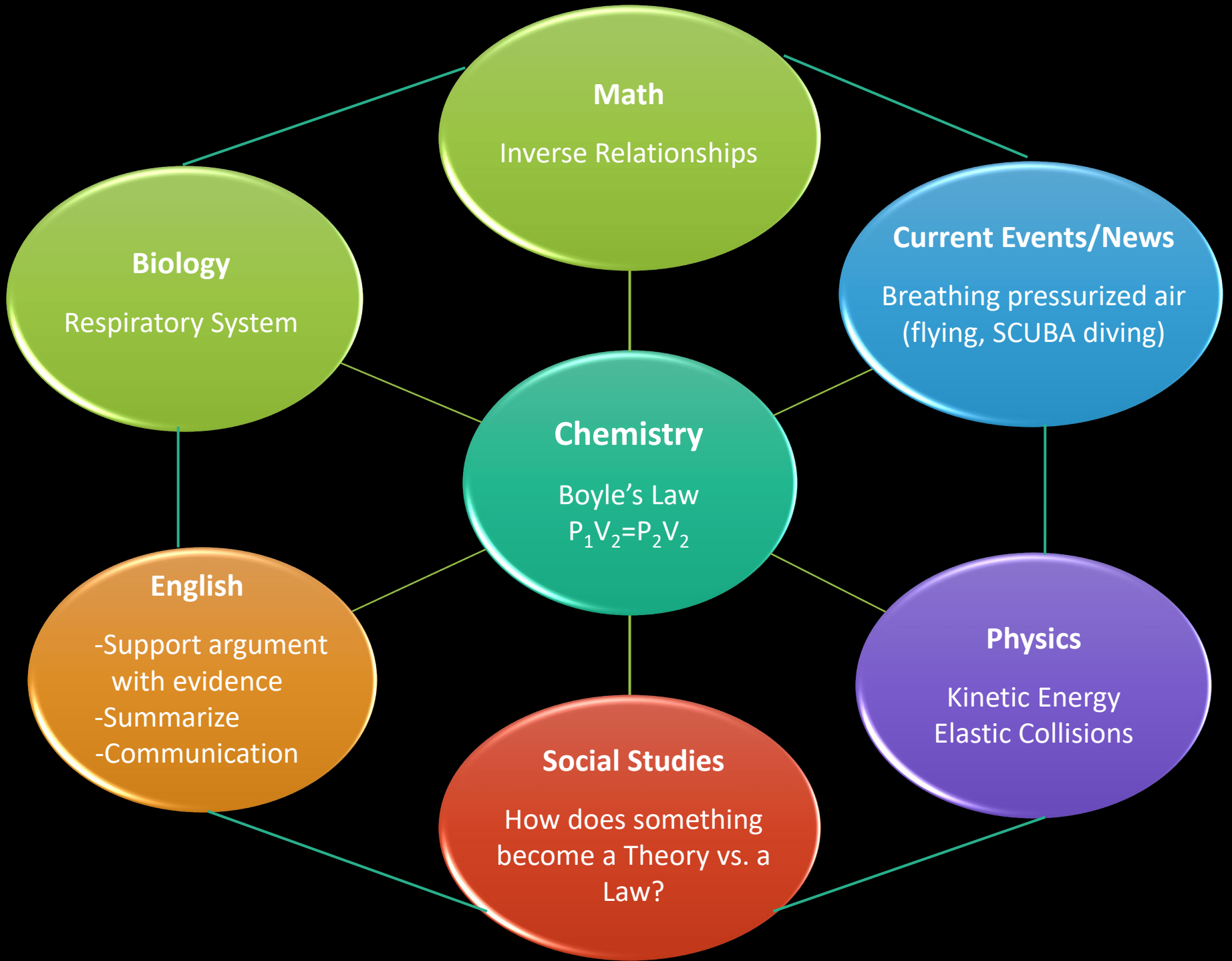




cellulose

Create a topic wheel to visualize interdisciplinary connections

Use to help plan individual lesson or collaborative unit


Math
Inverse Relationships
Biology
Respiratory System
Current Events/News
Breathing pressurized air (flying, SCUBA diving)
Chemistry
Boyle's Law
$P_1V_2=P_2V_2$
English
-Support argument with evidence
-Summarize
-Communication
Physics
Kinetic Energy
Elastic Collisions
Social Studies
How does something become a Theory vs. a Law?

PLANNING AND PREPARATION

1a Demonstrating Knowledge of Content and Pedagogy
1b Demonstrating Knowledge of Students
1c Setting Instructional Outcomes
1d Demonstrating Knowledge of Resources
1e Designing Coherent Instruction
1f Designing Student Assessments

CLASSROOM ENVIRONMENT

2a Creating an Environment of Respect and Rapport
2b Establishing a Culture for Learning
2c Managing Classroom Procedures
2d Managing Student Behavior
2e Organizing Physical Space

INSTRUCTION

3a Communicating with Students
3b Using Questioning and Discussion Techniques
3c Engaging Students in Learning
3d Using Assessment in Instruction
3e Demonstrating Flexibility and Responsiveness

PROFESSIONAL RESPONSIBILITIES

4a Reflecting on Teaching
4b Maintaining Accurate Records
4c Communicating with Families
4d Participating in a Professional Community
4e Growing and Developing Professionally
4f Showing Professionalism

Final Thoughts

- Start by making small changes to what you already do
- Time does **not** need to be split equally between each discipline
- Integrative and inquiry-based activities are still structured and follow a guided procedure
- There is still value in instrumental understanding
  - Need to memorize certain concepts before you can apply it

"What does _____ have to do with _____?"