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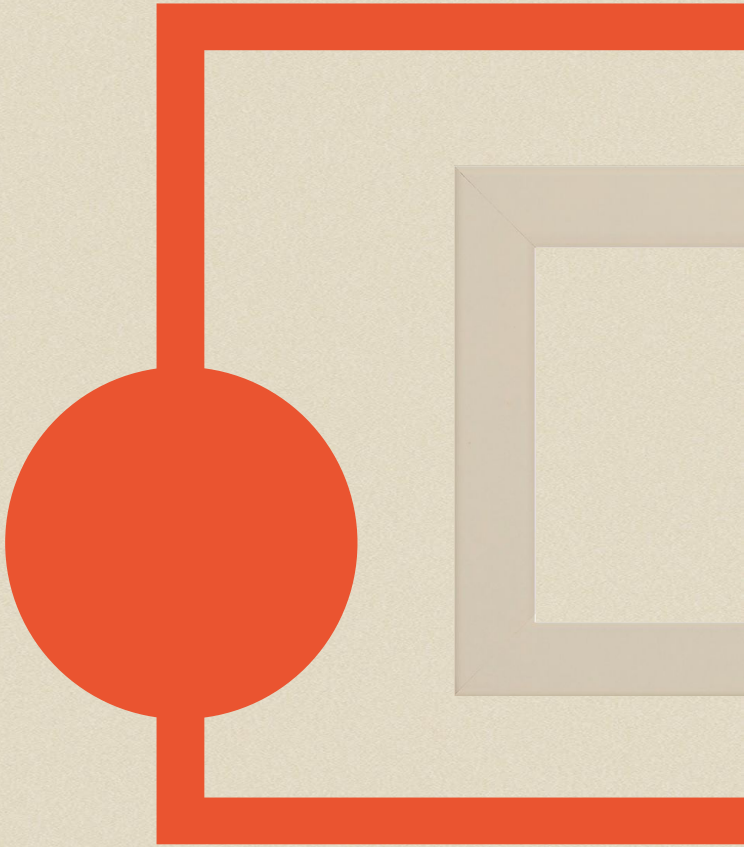
Storylines in Practice: Creating, Adopting, or Adapting

Christopher Like

Storylines in Practice

Creating, Adopting, or Adapting

Christopher Like- Iowa State Science Consultant



UNI Update Conference 2024

Outline

What is a storyline?

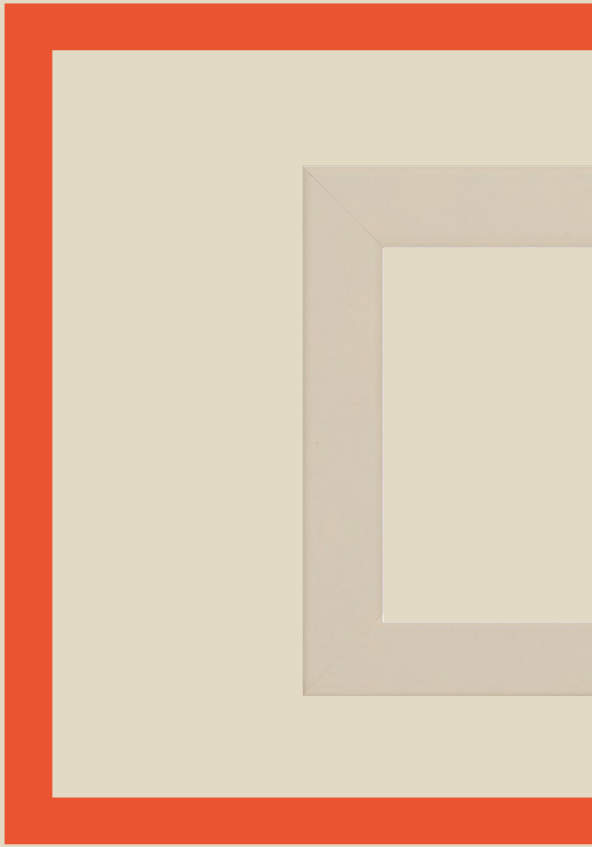
What is it like to create one

What to think about when adopting

What to think about when adapting

Storylining

What are your experiences?



Storyline Guiding Principles

Relevant	Phenomena-based (anchor vs lesson)
Questioning	Focus on student questions
Iterative	Content comes in chunks
Concepts	Smaller chunks fit under a larger concept
Sensemaking	Students are actively trying to figure something out

Student Sense-Making

Elements of Coherent Science Teaching

ATP and Energy

ATP: energy in a Molecule
No ATP: The cell will die

ATP: Adenosine Triphosphate --- The energy storage molecule

Cellular Respiration: an energy (ATP) creating & releasing process:
- Plants: Glucose - ($C_6H_{12}O_6$) produced during photosynthesis is broken down to release energy.
- Animals: Glucose - ($C_6H_{12}O_6$) is broken down during digestive so energy is released.

Equation: $C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + 6CO_2 + \text{energy}$

* The WASTE PRODUCTS of cellular respiration, CO_2 and water, are the REACTANTS used in photosynthesis.

$$\underset{\text{(Carbon Dioxide)}}{CO_2} + \underset{\text{(water)}}{H_2O} \xrightarrow[\text{Chlorophyll}]{\text{suns energy}} \underset{\text{(Sugars)}}{C_6H_{12}O_6} + \underset{\text{(Oxygen)}}{O_2}$$

* The PRODUCTS of photosynthesis are glucose ($C_6H_{12}O_6$) and O_2

3 steps of cellular respiration:
1. Glycolysis
2. Kreb's Cycle (Citric Acid cycle)
3. Electron Transport Chain (ETC)

Glycolysis:
- Occurs in the cytoplasm of the cell
- Starting molecule: One molecule of glucose ($C_6H_{12}O_6$)

Aerobic Respiration: Oxygen is present (if there's oxygen)
- IF OXYGEN is PRESENT, the products of glycolysis ENTER the pathway of aerobic respiration.
- 2 major stages: Kreb's cycle and Electron transport chain
- Produces LARGE amounts of ATP

Aerobic Respiration processes: (step 2)
* Kreb's Cycle (Citric Acid Cycle - CTA)
- Occurs in the mitochondrial Matrix (center of the mitochondria folds)
- Starting molecules: 2 pyruvates and oxygen
- Produces: NADH and $FADH_2$ and CO_2 and ATP molecules
- Each Pyruvate goes through the cycle to give 2 ATP total

Aerobic Respiration Processes: (step 3)
* Electron Transport Chain (ETC)
- Occurs in the inner membrane of the mitochondria.
- Starting molecules: NADH and $FADH_2$ and oxygen
- Uses the NADH and $FADH_2$ from the Kreb's cycle and another NADH from Glycolysis
- Produces: water and 32 ATP's
- $FADH_2$ and NADH, release H's so they can attach to oxygen and produce water.
- Energy (ATP) is made when hydrogens are pumped back through the ATP Synthase Protein!

Importance of Aerobic Respiration:
- To transfer chemical energy (glucose) to a form of energy that is useable by cells (ATP)
- Total net gain of ATP molecules per 1 glucose = 36 ATP's - if really efficient - 38 ATP
- 2 from glycolysis, 2 from Krebs, and 32-34 from the ETC

Anearobic Respiration: NO OXYGEN IS PRESENT
- Occurs AFTER glycolysis, only if NO oxygen is present
- No additional ATP is created after the 2ATP's from glycolysis!

Anearobic Respiration 2 types: Alcholic Fermentation and Lactic Acid Fermentation

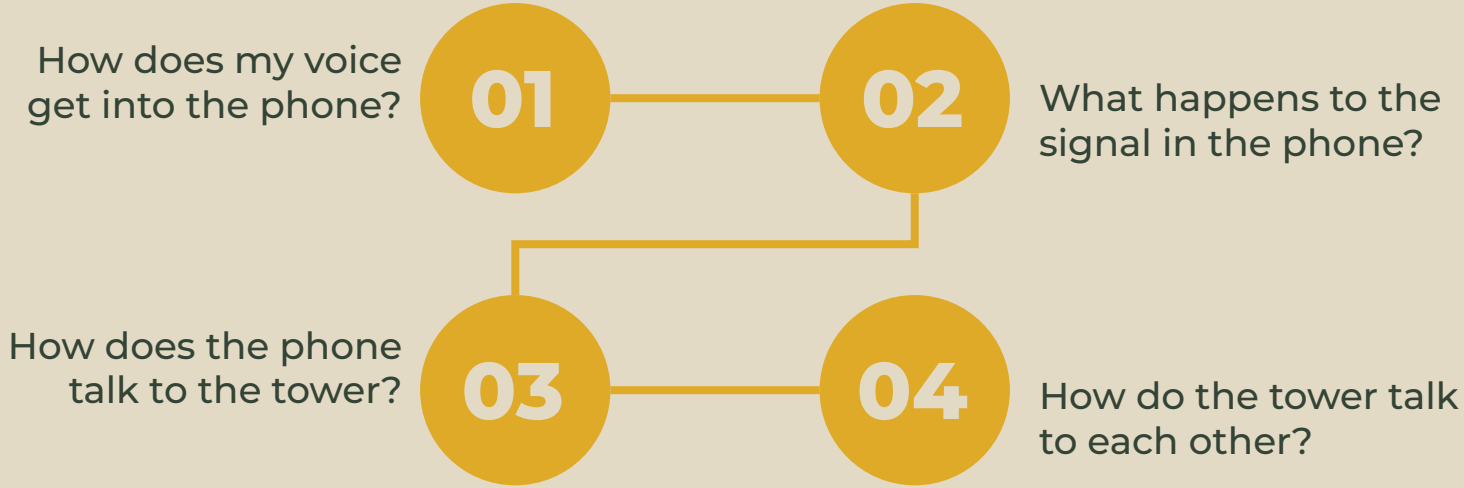
01

Creating

The story of the cell phone unit

How do I call across the country on a cell phone?

Phenomena-based unit



Classroom Routines

01

Anchoring Phenomena

Initial Models and Driving Question Boards

02

Investigation

Incremental Learning

03

Navigation

Developing Student Agency

04

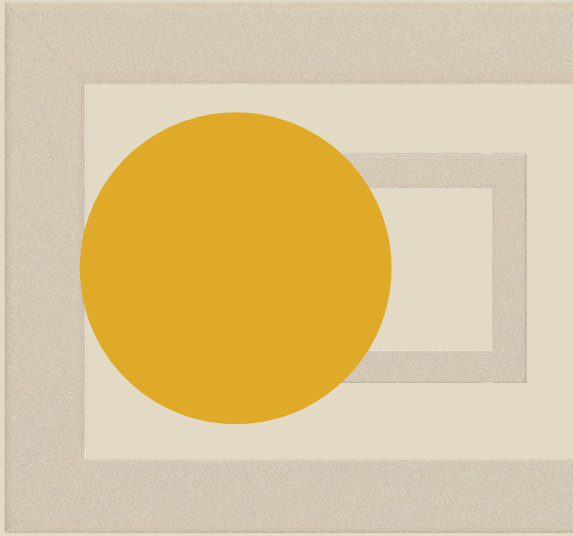
Putting the Pieces Together

Consensus Building

05

Problematization

Relevance



Reiser, Brian J. et al. “Storyline Units: An Instructional Model to Support Coherence from the Students’ Perspective.” Journal of Science Teacher Education 32.7 (2021): 805–829. Web.

How does sound get into the phone?

Dissecting a Microphone

Microphones have magnets, coils of wire, and a diaphragm

Modeling a Microphone

Moving a magnet near a coil makes electricity.

Sounds Like Fun

Sound vibrates the diaphragm in ways that make a signal

Music

$v = \lambda f$

Consensus Model

Putting the pieces together

Assessment

Jimi Hendrix

Recognition

The Physics Teacher

NGSS Badged Units

Authentic Science Experiences- WestEd

- *Designing High School Learning to Reach All Students*

More to think about...

3-DIMENSIONS	Bundling and unbundling to integrate all dimensions
ASSESSMENTS	Writing 3-dimensional assessments is not easy
LITERACY & MATH CONNECTIONS	Disciplinary Literacy and the new math
DIFFERENTIATION	Meeting the needs of ALL students
ACCESSIBILITY	Meeting the needs of ALL students
EQUITY	Meeting the needs of ALL students
RELEVANCE	Can I make it local and meaningful?
BIASES	Implicit and Explicit

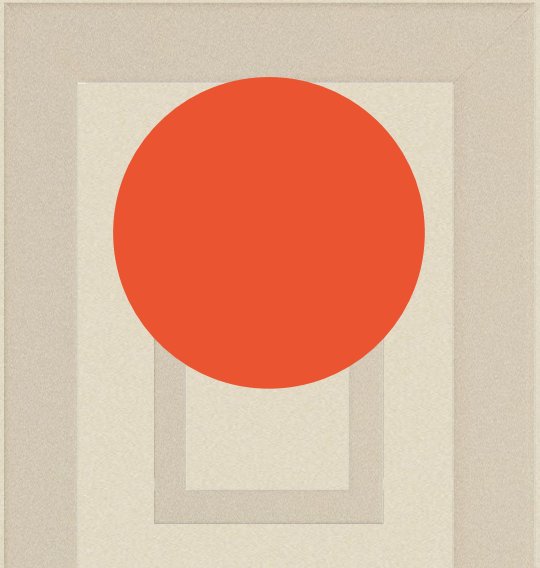
So what do we do?

02

Adopting

Find something good and use that!

Adopting



01

Choosing

Where to look and how to assess?

02

Professional Development

Nothing is plug and play

03

Implementation

Are all students the same?

04

Review

How often do you replace?

More to think about...

SENSE-MAKING	Does the curriculum hold to beliefs in student sense-making?
RELEVANCE	Why should your students care?
ALIGNMENT	Is the curriculum aligned to your state's standards?
AFFORDABILITY	Can you afford the cost and the upkeep?
TIME	Does the curriculum fit into your footprint?
WHO CHOOSES	Who is at the table making the decision?
PILOT	Do you take time to pilot? How many to pilot?
GRADING	Do the assessments fit your school's grading practices?

So what do we do?

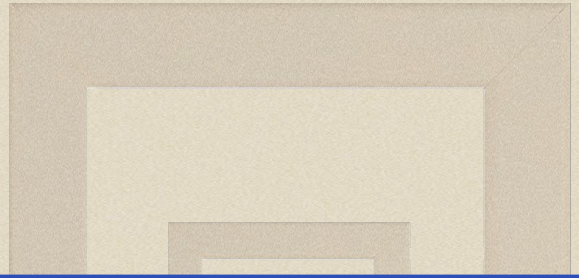
There is no perfect curriculum.

03

Adapting

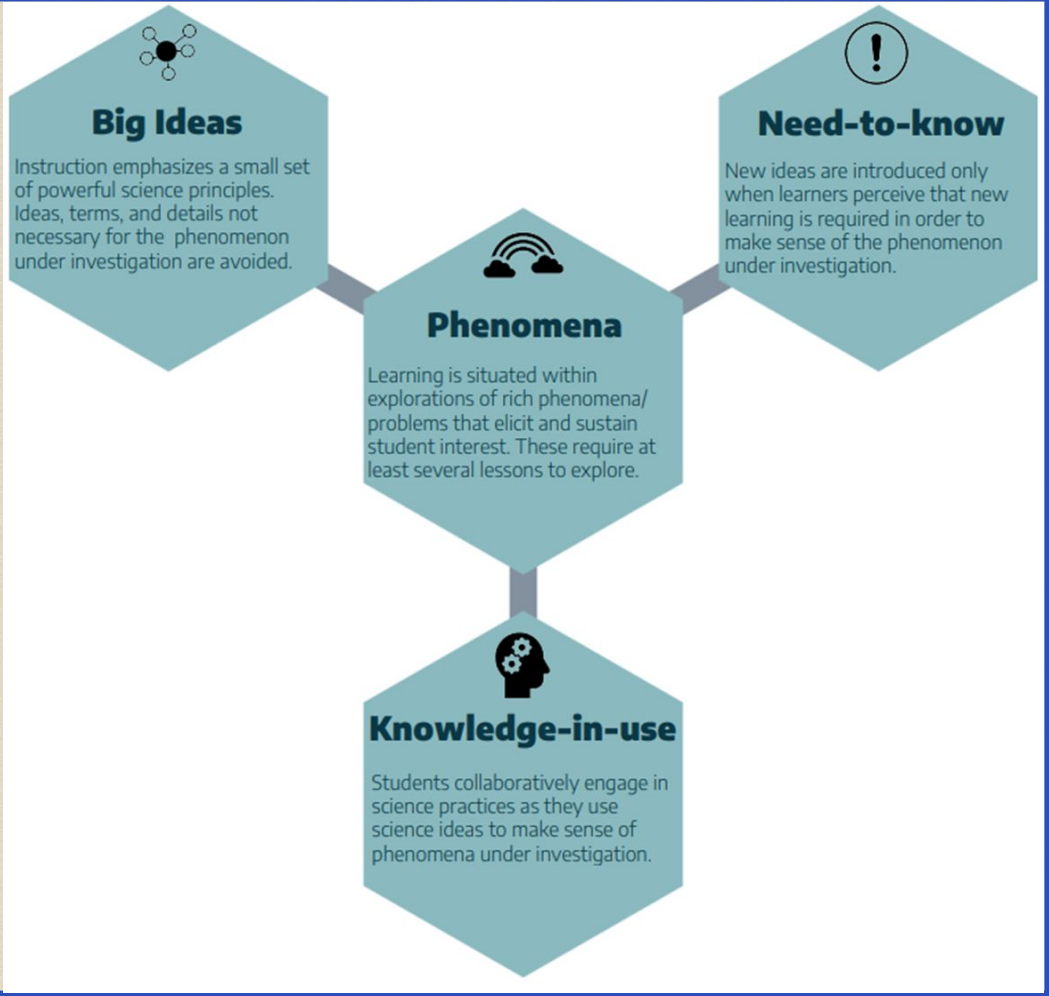
Find something good and make it your own.

But don’t screw it up!!



Storylining Non-negotiables

- Anchor Phenomena
- Driving Question Board
- Modeling
- Consensus
- Iterative

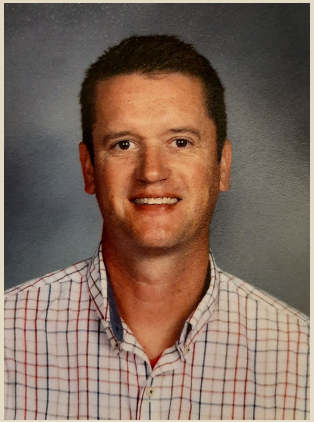


Resources

Cell Phone Unit

Classroom Routines

OpenSciEd Routines



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