

Phenomena



NATS - 3/27/2017

Framework for K-12 Science Education

- Nebraska's NEW Science Standards
 - Framework-Inspired
- Focuses on PROCESS of science.
- NATS Column (coming soon)

Process of Science

Engaging students in the process.

Disciplinary Core Ideas

Science and Engineering Practices

Cross-cutting Connections

What ties all these together? - Phenomena

Phenomena

- Provides the “WHY”
- They are observable events we use our science knowledge to explain or predict.
- Require designing engineering solutions to problems.
- “learning shifts from *learning about* a topic to *figuring out why.*”

Good Phenomena

- **Specific events**
- Builds on everyday or family experiences.
- Observable to students
 - Demos, videos, procedures, tools, data
- Applies multiple Performance Expectations.
- Too complex to solve after a single lesson.
 - Not “Googleable”

Using Phenomena

Should engage students in science and/or engineering practices.

Phenomena + Student Generated questions

Parts of a Phenomena:

Anchor Event (phenomena)

Develop Underlying Explanation (gapless storyline) - 2-4 weeks

Aspen Trees

ANCHOR: Trees collected at 9000 ft and 6000 ft. Transplanted to 5000 ft.
Leaf out at different times of the year. Why?

PE: Genetics, ecology,
species competition,
plant biology

EXPLANATION:

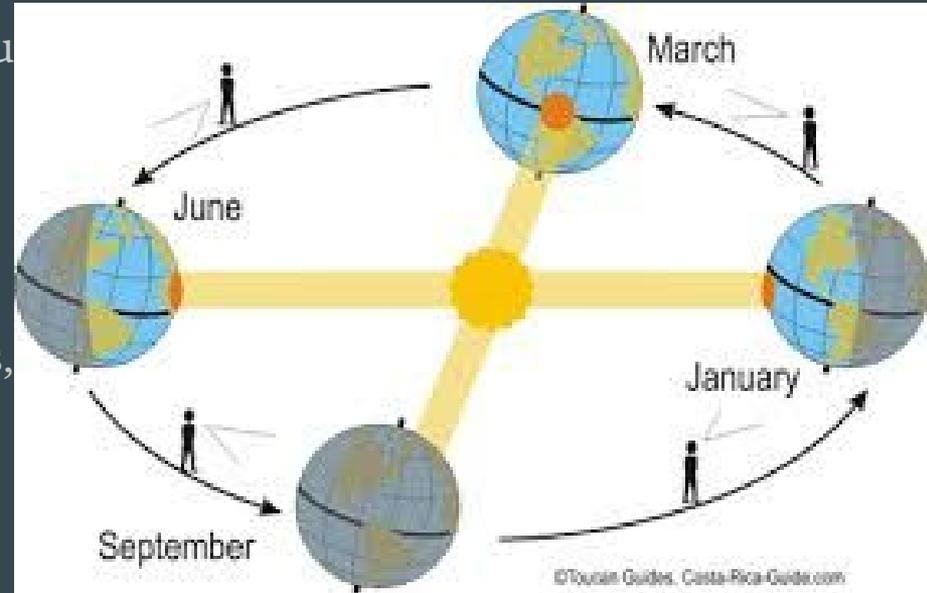


Seasons

ANCHOR: The Earth is farthest from the sun during summer and closest during winter. Why is it so cold in winter and warm in summer?

PE: Seasons, Energy Concentration, Waves, Inverse-square law, hemispheres

EXPLANATION:



Seasons:

Weak Explanations:

Earth is tilted 23°

Different parts get more direct sunlight

Brief, No storyline, not causal events or mechanisms

LET'S STUDENTS OFF THE HOOK!

Seasons:

Better:

Earth revolves around Sun in the ecliptic and takes 1 year to get around. As it revolves it also rotates on its axis.

The axis is not aligned with the ecliptic. It is 23° off from vertical. This means for approximately 6 months, the North Hemisphere is pointed away from the sun and for 6 months it is pointed away.

Only visible and radio waves make it through our atmosphere. Sometimes they are concentrated (like a flashlight directly on floor), other times they are spread out (like flashlight at an angle to floor). The same energy over a larger area. ...

Piping Plover

ANCHOR: Protected Bird at Lake McConaughy.
Lake is only 75 years old.

Why are we protecting the birds?

PE: Ecology, niche, habitat, man's
impact on environment, earth's history

EXPLANATION:

Further: sandhill cranes, sandhills, trees along
Platte River.



Chemical changes

Mix two chemicals and notice the changes.

Temperature, Color, Precipitate, etc.

Elements, Molecules, Atomic parts,
Chemical Bonds, Waves



Static Electricity

Why does water from the faucet move towards a hair comb?

Forces, Static, Charges, Atoms



Where to find Phenomena?

Around you every day.

Discrepant events.

Page Keeley's Books on Formative Assessment Probes

YouTube

Many great science channels (Smarter Every Day, Veritasium, Gross Science, etc)

Google Search

Pay attention to the links like: “## Really cool things you didn't know existed”

NATS Website (NGSS Resources)