

Using Eco-Schools for Science-Based Investigations

Project-Based Learning &
GLOBE Protocols



Kim Martinez
National Wildlife
Federation

Eco-Schools 7-Step Framework

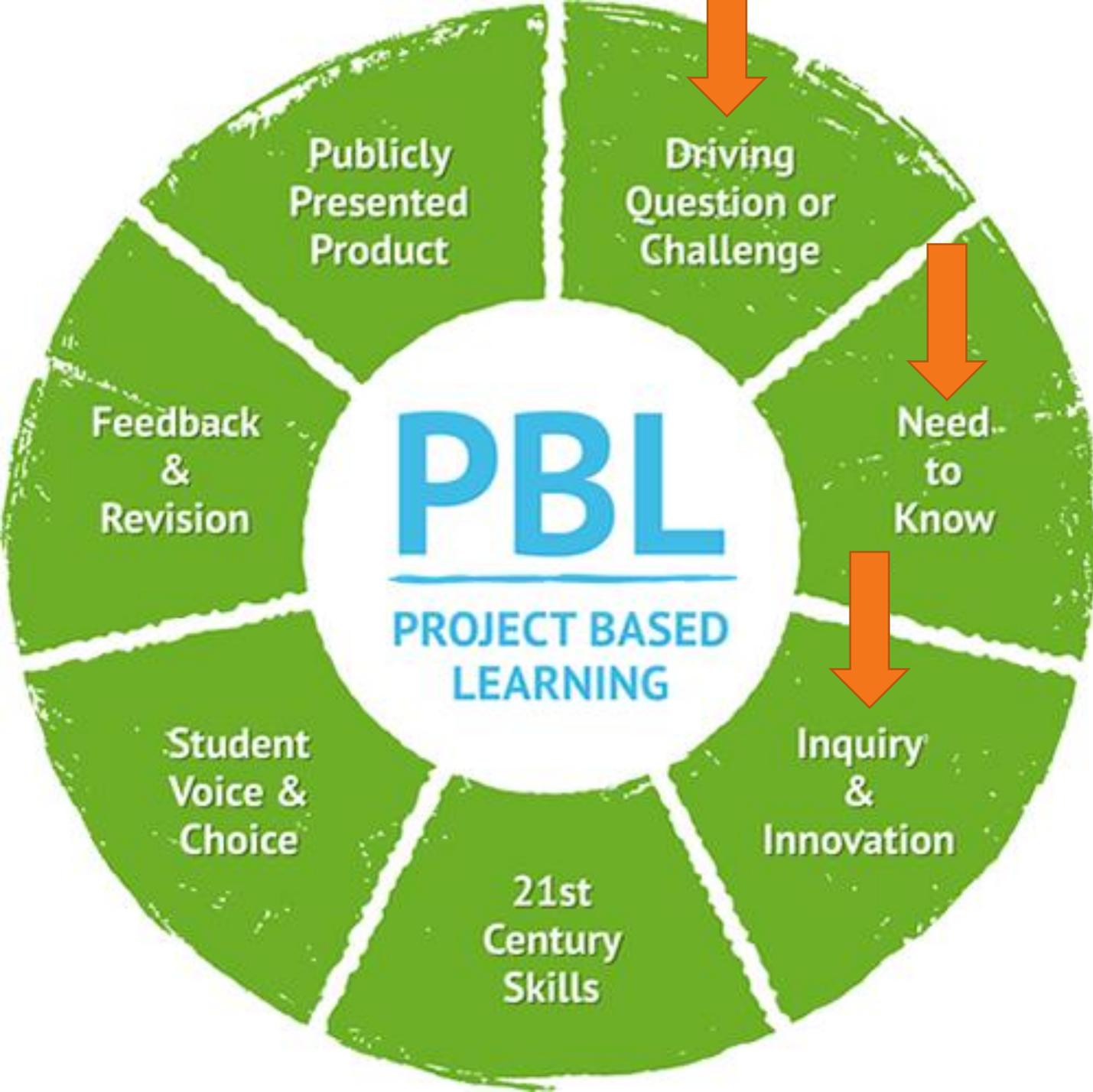
- Eco-School Counsel
- Audit
- Action Plan
- Monitor & Evaluate
- Curriculum
- Community
- Eco-Code

What is Project-Based Learning (PBL)?

Project Based Learning is a teaching method in which students gain knowledge and skills by working for an extended period of time to **investigate** and respond to an **authentic, engaging and complex question, problem, or challenge.**

Think: What might your students do to investigate environmental issues related to Water, Waste, Energy, or Forests?





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**Essential Elements
of
Project-Based
Learning (PBL)**



Students develop needed skills in:

- Information searching and researching
- Critical analysis
- Summarizing and synthesizing
- Inquiry, Questioning, and Exploratory Investigations
- Design and Problem-solving



Global Project-Based Learning (PBL)



What does PBL look like at an Eco-School?

- **Discovery Hill Outdoor Learning Center (Texas)**
- **Learning lab for field investigations**
- **Teacher training center used to build their confidence in teaching outdoors and how to successfully manage classes in the outdoors**
- **Native plants led to improved soil fertility and biodiversity**
- **Improved science and math skills**
- **Hands-on, experiential learning**



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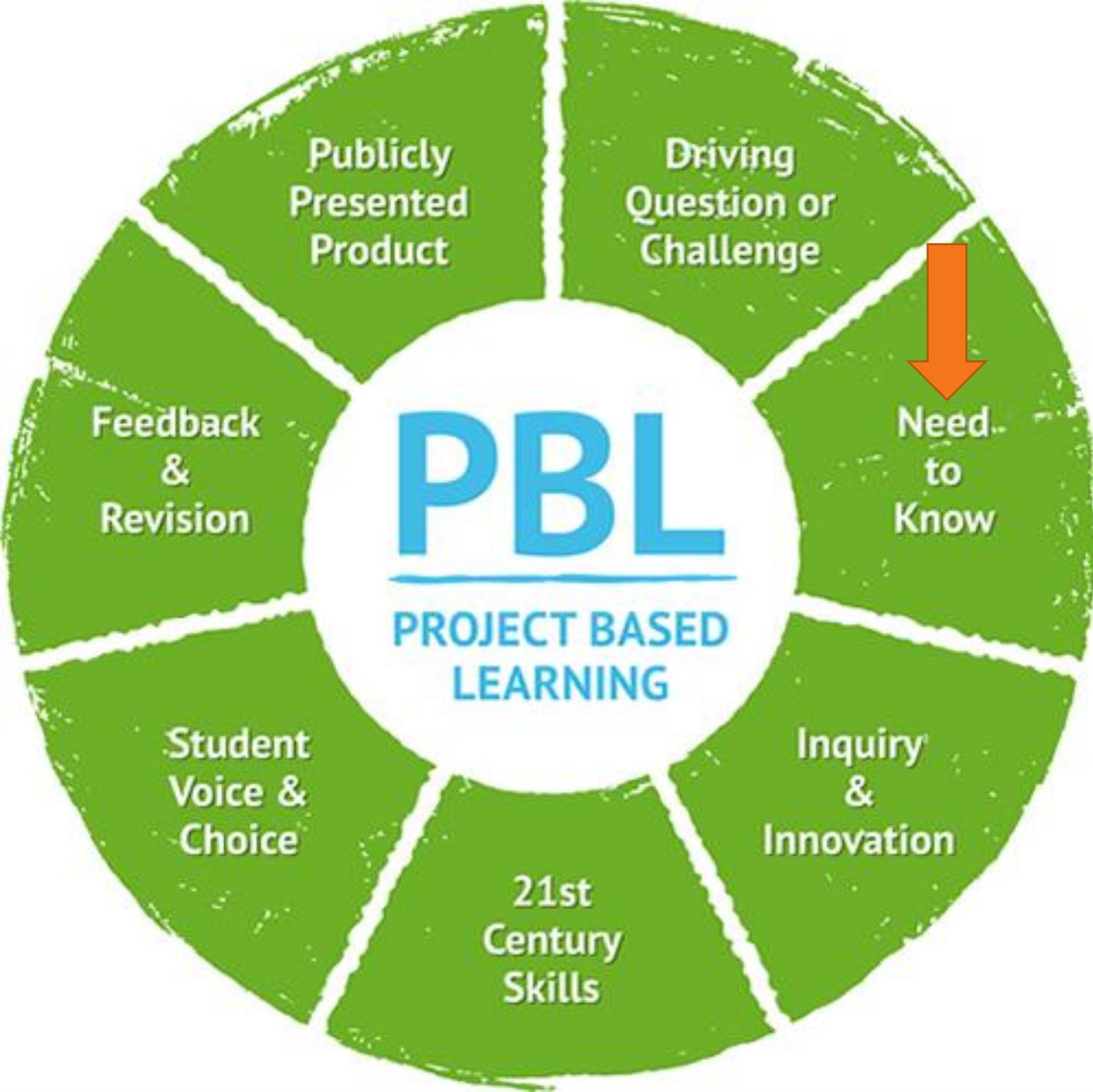
Essential Elements of Project-Based Learning (PBL)

It starts with a Driving Question:

How does healthy soil impact
schoolyard biodiversity?







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Essential Elements of Project-Based Learning (PBL)

What do students need to know?

Soil fertility

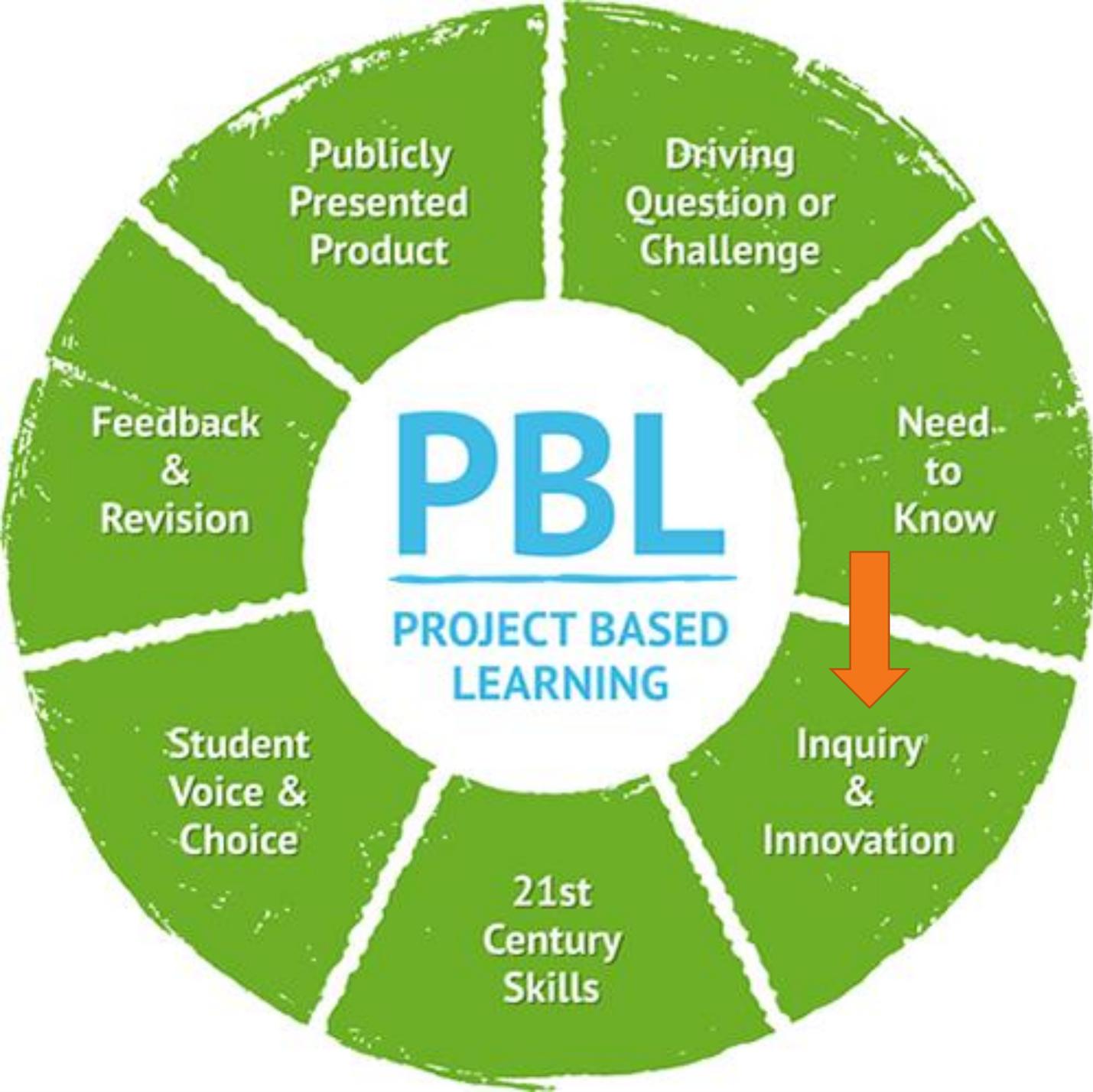
Soil pH

Soil moisture

Soil infiltration

Soil temperature

Soil characterization



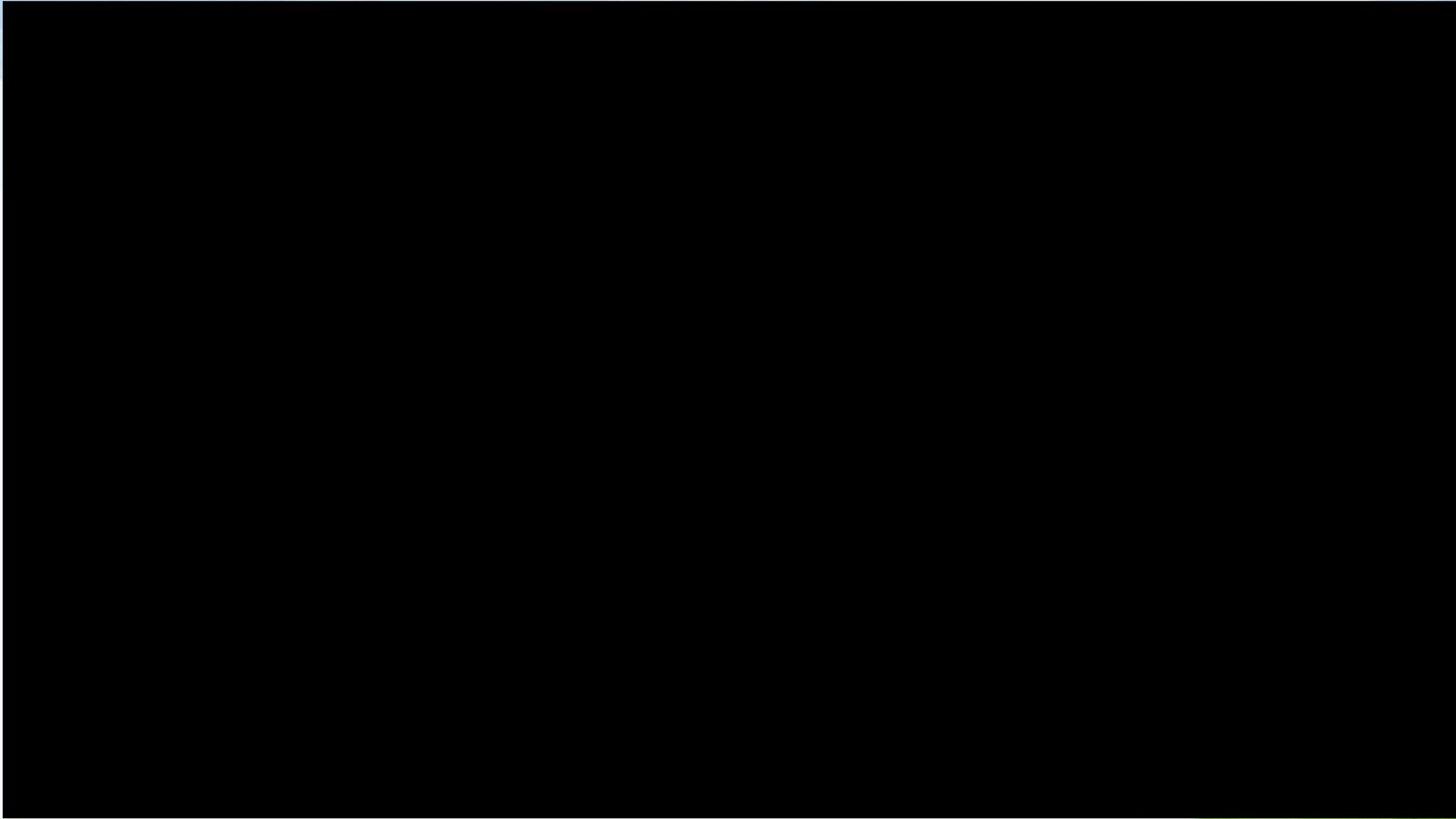
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Essential Elements of Project-Based Learning (PBL)



GLOBE Program= Student Inquiry

- **Global Learning and Observations to Benefit the Environment**
- **NASA satellite data + citizen science**
- **Trained teachers**
- **Scientific tools and protocols**
- **Professional scientists access data/ Students access NASA data**



GLOBE Scientific Protocols

Soil Fertility Protocol



Purpose

To measure the amounts of nitrogen (N), phosphorus (P), and potassium (K) in each horizon in a soil profile

Overview

Using a NPK test kit, students mix a dry, sieved soil sample into a solution and chemically extract the N, P, and K as nitrate, phosphate, and potassium. The N, P, and K amounts in the sample are determined by comparing the solution to a color chart. Students describe the N, P, K amounts as high, medium, low, or none. These measurements are conducted three times

Life Sciences

Atoms and molecules cycle among the living and nonliving components of the ecosystem.

Scientific Inquiry Abilities

Identify answerable questions
Design and conduct an investigation.
Use appropriate tools and including mathematics to analyze, and interpret data.
Develop descriptions and predictions and models of evidence.
Communicate procedures

Soil (Pedosphere) Investigation

Soil Fertility Data Sheet

Date of Sample Collection: _____ Study Site: _____

Horizon Number: _____ Horizon Depth: Top _____ cm Bottom _____ cm

Sample Number 1

Nitrate (N):

High__ Med__ Low__ None__

Phosphorus (P):

High__ Med__ Low__ None__

Potassium (K):

High__ Med__ Low__ None__

Sample Number 2

Nitrate (N):

High__ Med__ Low__ None__

Phosphorus (P):

High__ Med__ Low__ None__

Potassium (K):

High__ Med__ Low__ None__

Sample Number 3

Nitrate (N):

High__ Med__ Low__ None__

Phosphorus (P):

High__ Med__ Low__ None__

Potassium (K):

High__ Med__ Low__ None__





To summarize:

- PBL and GLOBE develop 21st Century Skills for emerging
- PBL gives students a voice
- GLOBE protocols add scientific rigor to the Eco-Schools Seven Step Framework
- GLOBE = Science & Eco-Schools = Action

GLOBE + Eco-Schools = science-based decision-making
(citizenship, stewardship)



Obrigada