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— African proverb

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An Immersive Approach to Problem- Based Learning

Michelle Gasser, Director of Curriculum and Instruction
STEM School Highlands Ranch/KOSON Schools

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An Immersive Approach to Problem-Based Learning

Michelle Gasser

Director of Curriculum and Instruction

Current: Director of Curriculum and Instruction

Expertise: Designing innovative curriculum and pathways for students.

Background: Elementary school teacher, instructional coach, school administrator

Education: M.A. in Educational Technology, National Board Certified Teacher, currently pursuing a Doctorate in Curriculum, Instruction and Assessment

Current: PBL Specialist at STEM School Highlands Ranch

Expertise: Inquiry-based Pedagogy, Inclusive Education, & SEL

Background: Middle School Math/Science & Instructional Coaching

Education: M.A. in Teacher Leadership (Capstone: PBL Framework in Traditional School Settings)

Mackenzie Harper

PBL Specialist

OBJECTIVES

- Understand the PBL methodology
- Learn the process of structuring units around a central problem
- Plan structures that allow students to implement real solutions, advocate for change, and make an impact on their immediate surroundings
- Connect PBL to Standards

What if…

- Students were able to express their learning in a way that was meaningful to them.

- Every classroom was a collaboration space where students worked together to solve problems.
- Those problems were real world and industry driven.

The answer = PBL

WHAT IS PBL?

Problem-based learning (PBL) is a student-centered approach in which students learn about a subject by working in groups to solve an open-ended problem. This problem is what drives the motivation and the learning (Cornell, 2026).

In general, students:

- Examine and define the problem
- Acquire information and tools necessary to solve the problem
- Develop possible solutions
- Report on their findings

History of PBL

- Designed for medical students
- Problem-Based Learning usually focuses on the process of solving a problem, whereas Project-Based Learning often focuses on creating a final product or artifact.
- K-12 schools report challenges with standardized curriculum and PBL
  - Lack of teacher training
  - Logistic barriers

- Kirschner, Sweller, and Clark (2006): New learners are often overwhelmed by open-ended discovery and learn better from examples that are already explained to avoid cognitive overload

    - **You are a mission specialist** for a private space agency. You must design a self-sustaining life-support system for a 10-person colony on Mars (Lennon-Clowes & Capraro, 2017)

    - AT STEM– this problem would sound like…”Mars is a cold, hostile desert with toxic soil, unbreathable air, and frozen water”.

Our Approach to Problem Based Learning

- We don’t create problems. We inform students of facts.
- We challenge students to consider **how they can help**.
- We integrate content into the problem solving process.

Hmelo-Silver, Duncan, and Chinn (2007) argue that effective Problem-Based Learning is not "unguided discovery," but is actually highly structured through **specific scaffolds.**

Examples of Scaffolds

Students will need…

- A way to organize information and research (research graphic organizer)
- An order of operations (a checklist)
- A template for an action plan
- A template to share their solutions (slideshow template with headers)

How to:

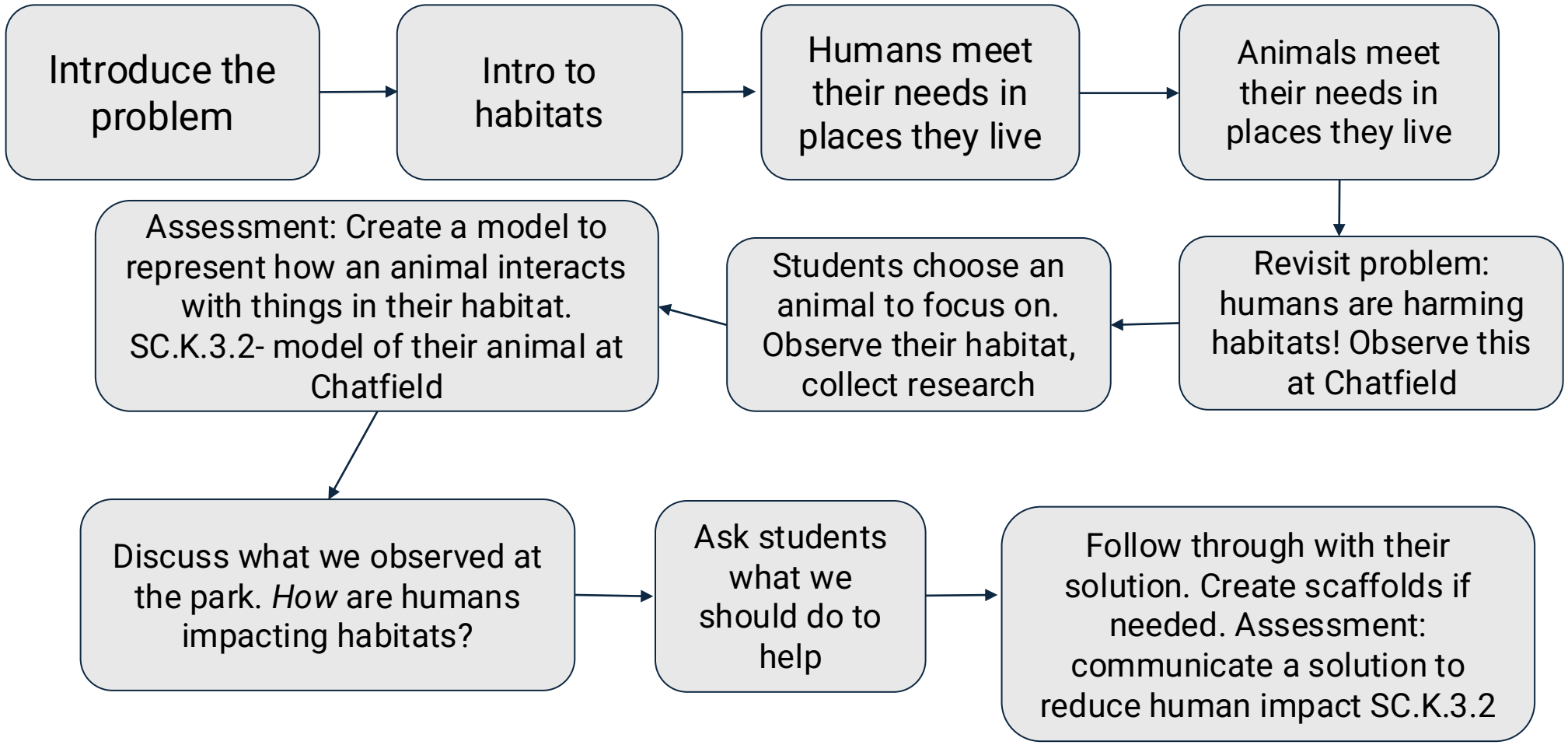
1. Identify the standards
2. Write learning objectives and assessment goals
3. Think of a theme – Where is this content useful in the real world?
4. Narrow the theme into a relevant problem statement
5. Create a storyboard
6. Plan lessons and scaffolds; recruit volunteers and partners

The "Kinder Garden"

(New) Kindergarten Example

- **Standards:** Animals meet their needs in their habitats, communicate solutions to reduce impact
- **Theme:** Animals need healthy habitats
- **Problem Statement:** Animals' habitats at Chatfield State Park are affected by humans! What can we do to help?

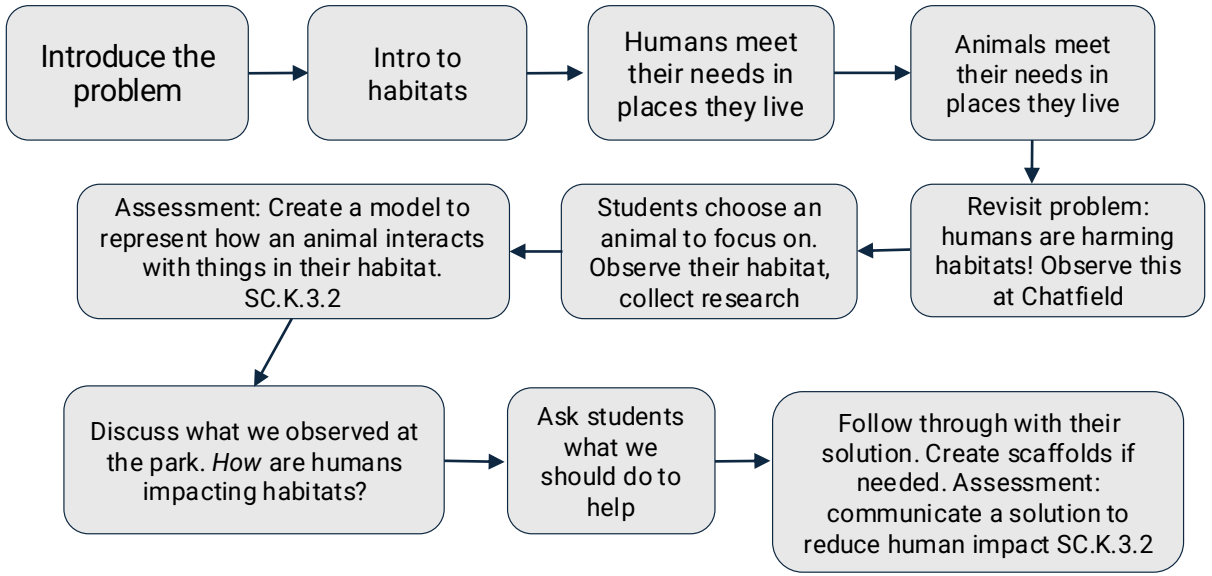
Storyboard Example



Plan Scaffolds

Students will need…

- A list of animals at Chatfield to choose from
- A way to collect research
  - PBL Guide: Kindergarten Habitats Chatfield
- Scaffolds for solution as needed



Group Problem

As greenhouse gases trap more heat in the atmosphere, Colorado's winters are becoming shorter and warmer.

We Learned…

- Greenhouse gases reflect infrared radiation back toward the Earth's surface. Higher gas concentrations raise average temperatures (the Greenhouse Effect)
- Melting snow reveals dark ground, which absorbs more solar heat. Less snow cover means less heat is reflected away from Colorado (Albedo Effect)
- Changing heat patterns alter wind currents, pushing cold air north (Convection).
- Warmer air acts like a sponge, pulling moisture from snow and soil. This dry air heats up faster, creating a feedback loop that intensifies Colorado's winter warming and drought.

Action Plan

Problem: As greenhouse gases trap more heat in the atmosphere, Colorado's winters are becoming shorter and warmer.

You decide:

- What are you trying to change?
- Who are you hoping will change?
- How will you make that happen?

How Standards Connect to PBL?

Instructional Shifts Over Time

	Pre-Colorado Standards	Colorado Model Content Standards	Colorado Academic Standards
Standards	• Content Knowledge	• Content Knowledge • Content Specific Skills	• Conceptual Understanding of Knowledge • 21st Century Skills across all content areas • Mastery: application and transfer of knowledge and skills
Curriculum	• How many U.S. Senators does Colorado have?	• How are U.S. Senators distributed among the states? • What historical factors determined Senatorial representation?	• Why is it important to understand the foundations of our national government? • Why should we know who are senators are? • How and when is knowledge of our U.S. Senators important?
Instruction	• Teacher centered • Rote memorization • Recall	• Teacher centered • Some content specific questioning and skills	• Student directed • Analyzing/explaining concepts • Skills to plan and develop solutions to problems

Common Core/Colorado standards consistently use action verbs that align with the upper tiers of Bloom's

Bloom's Level	Common Core Language
Analyze	analyze, compare, examine, determine, differentiate
Evaluate	justify, critique, assess, defend, argue
Create	develop, construct, design, model, produce

Common Core standards intentionally align to the highest levels of Bloom's Taxonomy—making Problem-Based Learning a natural instructional match.


Q&A

“Your feedback helps us all move forward together

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