

Grade Level/Course: 5 th Grade Science	Authentic Problem: Finding a fossil to create a creature
Unit of Study Alignment: To which unit is this problem aligned? Life Science	Timeline: 2 nd 9-weeks (Ch. 2, lessons 3&4)
Big Ideas: Using fossils to identify adaptations which help an organism survive in a particular biome and enable it to reproduce	
Project Launch: How will you introduce this problem to students? Students are given cards with pictures of fossils. They will identify adaptations/features that may have helped the creature adapt to and survive in its biome.	
Driving Question: What specific characteristics does an animal need to have to survive in specific environments so it lives long enough to reproduce? Sub Questions <ul style="list-style-type: none"> ▪ What do fossils tell us about types of adaptations that help organisms survive in a particular environment? ▪ Which inherited traits vs. acquired, environmental, or learned traits in organisms could have led to adaptations and survival in a habitat? 	Student roles: What lenses will students view the problem through? (cultural, economic, cost analysis, political, social, environmental, etc) What roles do these lenses create? Archaeology Paleontology Geology Genetics Environmental Political Economic Technology
Standards: Which major standards and evidence outcomes can students meet through this PBL? 2009 Standards SPI 0507.5.1 Identify physical and behavioral adaptations that enable animals such as, amphibians, reptiles, birds, fish, and mammals to survive in a particular environment. SPI 0507.5.2 Explain how fossils provide information about the past. 2018 Standards 5.LS4.1 Analyze and interpret data from fossils to describe types of organisms and their environments that existed long ago. Compare similarities and differences of those to living organisms and their environments. Recognize that most kinds of animals and plants that once lived on Earth are now extinct. 5.LS4.2 Use evidence to construct an explanation for how variations in characteristics among individuals within the same species may provide advantages to these individuals and their survival and reproduction.	
Collaborative Structures: What collaborative structures will you embed in your instruction and progress of this unit? How will you use them? How will you set them up for students? Why are you using those specific structures? <i>Students will be grouped in pairs to investigate the 6 examples. They will do online research to explore specific characteristics and how they relate to adaptations which enable survival. Partners will create a Sway presentation with animal adaptations and a drawing of their creature derived from their fossil find and biome.</i> <ul style="list-style-type: none"> • Adaptations that might help to catch food or hunt. • Adaptations that might help to provide self-defense or to avoid predators. • Adaptations that might help to adjust to seasonal climate changes. 	

<ul style="list-style-type: none"> • Adaptations that might help with movement. • Adaptations that might help to communicate or to attract a mate. • Clues that help you determine whether the traits are inherited, instinct, or learned behavior that help your creature survive. 	
<p>Culminating Products: How will students communicate or demonstrate their learning or outcomes for this problem in an authentic way?</p> <p>A Sway presentation following a rubric will be presented to the class via Canvas. OR A hard-copy poster following the rubric will be presented to the class.</p>	<p>Outside Resources: (Guest speaker, field excursion, etc.) Paleontologist speaker or Skype if possible (Janet Robinson) Margaret Allard @ Children's Museum Gary Crites @ McClung Museum Geology & Fossil History of Tennessee Exhibit @ McClung Museum</p>
<p>Experts (Who, what industry, invitations, thank you notes) Janet Robinson, ORNL scientist Margaret Allard, Children's Museum, geologist and exhibit designer John Quarles or Heather Henderlight to assist with Sway presentations</p>	<p>Rubrics/Assessments: What evidence would there be that students are learning the concepts and progressing? How will you assess students along the Way?</p> <ul style="list-style-type: none"> • Notes from research • Meeting project deadlines • Completion of rubric elements • Sway presentation • CFA and summative tests on inherited traits and Chapter 2 test
<p>Technology Integration Devices Online textbook and instructional materials Research websites Links to videos and websites Canvas: CFA, rubric, and summative test Sway presentation</p>	<p>Curricular Materials Video on what is a paleontologist https://www.youtube.com/watch?v=1FjyKmpmQzc Websites for research Fossil example cards Sway construction instruction Rubric Online textbook/hard copy</p>
<p>Costs: (materials, transportation, speakers) Fossil cards Fossil specimens Fieldtrips (Children's Museum, McClung Museum)</p>	<p>Additional notes: NEW EXHIBITION: Dinosaur Discoveries May 23, 2016 Uncategorized</p>

Reading & Lang. Arts Connection – How does the study of fossils relate to our everyday lives?
Journeys: Fossils: A Peek into the Past, Trapped in Tar, Journey of the Woolly Mammoths, FossilsSkills:
Informational Texts, Fact and Opinion, Poetry, Informational Writing, SummaryUse the PBL Design
Elements Unit Analysis Graphic Organizer to take notes.

Students

- Are students grappling with a complex, relevant problem in the project launch?
- Are students learning rigorous content knowledge through the project work?
- Are students able to track their progress as they analyze, apply and collaborate?

Teachers

- Are teachers orienting students to the project in the project launch?
- Are teachers providing purposeful and rigorous content instruction facilitating sensemaking, and preparing students for productive group work?
- Are teachers setting up cycles of feedback and reflection?
- Are teachers ensuring students are prepared to clearly and effectively communicate their work?

Project Design

- Does the project launch spark students' motivation by creating a need to know in response to a compelling driving question?
- Is the project work aligned to standards?
- Does the project highlight authenticity and real world practices?
- Does the project work showcases students' content learning?
- Does skill development deepen over time?
- Are there formative and summative assessments that attend to both individual and group work?

	Project Launch Sparks student engagement	Project Work Drives core content learning & disciplinary skills	Culminating Products Speak to a local or global audience
 Students	Students begin a PBL unit by: <ul style="list-style-type: none"> • immediately grappling with a complex, relevant problem. • drawing on what they already know from prior experience. 	Students respond to the project challenge by: <ul style="list-style-type: none"> • engaging with a rich variety of resources that support rigorous content learning. • tracking their progress as they gain knowledge necessary to analyze, apply, and collaborate 	Student products showcase: <ul style="list-style-type: none"> • understanding and application of core content knowledge. • craftsmanship and creativity. • connections to the world beyond the classroom. • strengthened personal and civic responsibility, courage and empathy.
 Teachers	Teachers begin a PBL unit by: <ul style="list-style-type: none"> • orienting students to the project. • prioritizing students' ideas, prior experiences, and problem solving. 	Teachers support the project by: <ul style="list-style-type: none"> • providing purposeful and rigorous content instruction. • facilitating sense-making activities. • preparing students for productive group work. • engaging with students in cycles of feedback and reflection in order to monitor learning and project progress. 	Teachers support culminating products by: <ul style="list-style-type: none"> • creating meaningful opportunities for sharing final products with the larger community. • preparing students to clearly and effectively communicate their work.
 Project Design	PBL units launch by: <ul style="list-style-type: none"> • sparking students' motivation by creating a need to know in response to a compelling driving question. • grounding academic work in real-world contexts that matter to learners. 	Project work is designed to : <ul style="list-style-type: none"> • encourage students to think like subject matter experts in order to solve a contemporary problem. • organize learning into modules that deepen understanding over time and pace students in their project work. 	Project products are designed to: <ul style="list-style-type: none"> • spotlight students' content learning and skill development. • ensure each product reflects a particular perspective or context. • attend to both individual and group work.

Educurious project-based learning units are aligned to national standards and strategically leverage innovative technologies and engage disciplinary and community experts via the Expert Network to collaborate on student projects, bring relevance to classroom instruction, highlight potential career pathways, and share diverse perspectives.

	Launch	Learning Process	Project
 Role of the Student			
 Role of the Teacher			
 Role of the Project Design			

Summary Table

Activity	What We Did	What I Learned	How I Will Use This in My Context
Co-Design as a Design for Professional Learning			
Definitions of High Quality, STEM Project-Based Learning			
Analyzing a Project			
Reviewing the Student Data and Teacher Outcomes			

“Many education reforms offer visions for what teaching and learning within schools and districts should look like. Reform efforts, however, can fall short because they constrain teachers’ opportunities to contribute their expertise toward achieving such visions (Snow, 2015). Teachers typically encounter these visions as new policies and guidance that circumscribe their autonomy in deciding what and how to teach (Allen & Penuel, 2015; Bryk, Gomez, Grunow, & LeMahieu, 2015). Historically and continuing today, two aspects of teachers’ agency are limited within educational reform efforts, namely, their capacity to shape and define the course of the reform effort and their level of control or volition (Konopasky & Sheridan, 2016).

Collaborative design, or co-design, in design-based research is one strategy for leveraging the expertise of teachers to design, implement, and test educational innovations and thereby expand teachers’ agency within reform efforts. Co-design is a “a highly-facilitated, team-based process in which teachers, researchers, and developers work together in defined roles to design an educational innovation, realize the design in one or more prototypes, and evaluate each prototype’s significance for addressing a concrete educational need” (Penuel, Roschelle, & Shechtman, 2007, p. 51). Co-design is inspired by the tradition of participatory design in Scandinavia, which has long promoted the agency of workers in the design of technologies and practices intended to transform the workplace (Ehn, 1992; Simonsen & Robertson, 2013). In Scandinavia, participatory design is an integral part of efforts to promote not just more usable technologies but also the ideals of workplace democracy, in which workers have a say in initiatives that affect their practice (Kensing & Greenbaum, 2013).

Co-design represents an emerging approach within the learning sciences for producing more usable innovations and for expanding teachers’ agency in the process of improving teaching and learning. Learning scientists have explored co-design’s potential for the design of curriculum materials (Peters & Slotta, 2009; Reiser et al., 2000), interactive technologies (Penuel et al., 2007; Spikol, Milrad, Maldonado, & Pea, 2009), teacher professional development (Voogt et al., 2015), and strategies for school and district reform (Cobb, Jackson, Smith, Sorum, & Henrick, 2013; Kwon, Wardrip, & Gomez, 2014). Most recently, co-design has become an integral part of community-based design research (Bang, Medin, Washinawatok, & Chapman, 2010) and social design experiments (Gutiérrez & Jurow, 2016/this issue; Taylor & Hall, 2013). In these projects, there are many examples of researchers acting as facilitators of co-design who successfully build a context for amplifying teachers’ voices in conversation relative to those of administrators who might otherwise seek to constrain their autonomy (e.g., Penuel, Tatar, & Roschelle, 2004; Voogt et al., 2015).”

Excerpt taken from: *Organizing for Teacher Agency in Curricular Co-Design*. S. Severance; W. R. Penuel; T. Sumner; H. Leary. JOURNAL OF THE LEARNING SCIENCES, 25: 531–564, 2016. <file:///Users/janechadsey/Downloads/2016-Severanceetal-Organizingforteacheragencyincurricularco-design.pdf>