



Phenomena-Based Products

BASED ON: *AMBITIOUS SCIENCE TEACHING* BY THOMPSON, WINDSCHITL, & BRAATAN
AND *THE QUEST FOR LEARNING* BY ALCOCK, FISHER, & ZMUDA



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TOPIC:

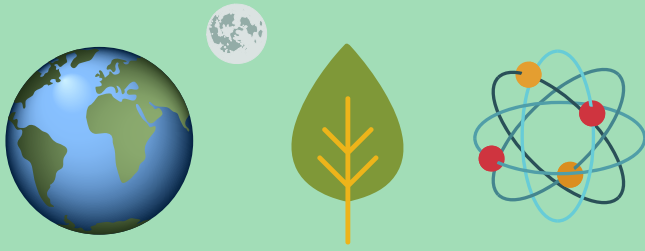
NOTES:

PHENOMENON:

- Choose a PHENOMENON that aligns with your current topic.
- This master list of PHENOMENA from Paul Anderson may be helpful:
<https://tinyurl.com/te2g3we>
- Think about observable and non-observable characteristics. (For addressing misconceptions, not explicit teaching...yet.)
- Think about potential model types and what the attributes are of a successful model.

3-D DECISIONS:

- Once you've chosen your PHENOMENON, locate related Disciplinary Core Ideas. Note the DCI codes that relate to Performance Expectations that detail what students will have to demonstrate.
- Using the coding system preceding the Performance Expectations, locate companion Engineering Practices and Crosscutting Concepts.
- Have students create initial models using as much visual and textual detail possible. Focus on descriptions and documentation of all things observable.
- Conjectures, hypotheses, inferences, and wonderments are all welcome.
- After the INQUIRY process, revisit models to edit, refine, and update.
- Have students collaborate with each other to give feedback on additional opportunities for revision and improvement.



CONSIDERATIONS:

Reflection:

Reflect on the student work and product delivery. Ask students what went well and how they might apply what went well to the next learning experience. Ask students which parts of the learning experience would benefit from more individual or more group work, or soliciting more information from alternative resources including experts.

Considerations:

Teacher / Student and Student / Student feedback is essential throughout this learning experience. Invite experts into the learning experience at any time through letter writing or social media engagement.

INQUIRY:

- Decide on a conversation / inquiry protocol, or be open to students using multiple protocols.
- Brainstorm possible probing (teacher) and essential questions.
- Anticipate possible student questions and create space for those questions both orally and in writing, explicitly inviting student voices.
- Students' questions can be about the phenomenon, the DCI, any related engineering practice or crosscutting concept, or anything else.
- Invite students to question each other.
- Generate as many questions as you can, collaboratively.
- Sort questions into 3 or 4 big ideas or categories from which you will launch the upcoming Research and Development.

PRODUCT: Research, Development, and Delivery:

- Take each big idea or category and refine, revise, improve, or add to the questions, perhaps combining similar questions.
- Embark on research with available media to discover answers to questions, with language of Performance Expectations in mind.
- Compile evidence-based statements that answer questions or support the analysis of the big ideas or category.
- With students, decide how they might want to share their work. (With PE's in mind) Several templates are attached.
- What could students DO with their learning? Who is their audience? What are some potential products or deliverables?
- Create the draft for the deliverable, setting potential check-points for students to keep them self-directed and on time.
- Edit, revise, and make deliverable ready for final publication, performance, or presentation. Deliver product to intended audience.
- Solicit audience feedback informally as a conversation or formally with a survey or descriptive feedback.



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NOTES:

Use the Inquiry to Learning Strategy organizer to help students think about where they might look for research opportunities, including multiple types of media and potentially experts in the field. Students can also brainstorm some ways in which they can document their learning, including modeling, in visual and written formats. This is also a good time to broach the topic of audience and start thinking about how to refine their learning.

INQUIRY to LEARNING STRATEGY

BIG IDEA OR CATEGORY:

ADD ANY ADDITIONAL INFORMATION ABOUT THE BIG IDEA OR CATEGORY:

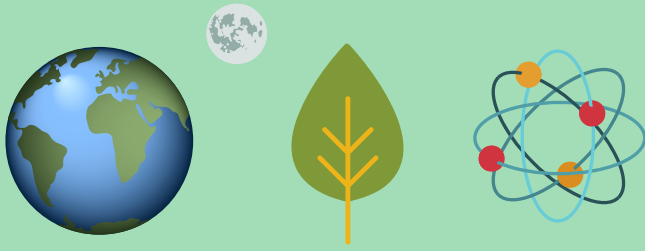
QUESTIONS TO ANSWER:

WHERE TO FIND MATERIALS:

PLANS FOR DOCUMENTING LEARNING:

POTENTIAL AUDIENCE?

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NOTES:

LEARNING GOAL MAP

CHALLENGE:

STANDARDS:

TRANSFER GOALS

UNDERSTANDINGS / ESSENTIAL ?S

CONTENT AND SKILLS

DELIVERABLE:

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NOTES:

Use the student version of the learning goal map to invite students into documenting their own learning as a companion to the Learning Goal Map. Note that this can be extended with additional parameters such as assessments or individual tasks and it pairs nicely with the Deliverables and Outcomes organizer.

LEARNING GOAL MAP: STUDENT VERSION

CHALLENGE:

ESSENTIAL QUESTIONS:

STUDENT-DRIVEN QUESTIONS:

SHORT-TERM LEARNING TARGETS:

LONG-TERM GOALS:



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NOTES:

Use the Deliverables and Outcomes Planner to document potential products, presentations, or performances where students can show what they can do with their learning. Additionally, this is a good time to capture potential unexpected outcomes such as ancillary learning or the expansion of the value of the learning for a bigger audience than initially planned for.

DELIVERABLES and OUTCOMES

CHALLENGE:

POTENTIAL DELIVERABLES IMAGINED BY TEACHER / STUDENT:

POTENTIAL UNEXPECTED OUTCOMES:

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NOTES:

Use the deliverable considerations to coach students through the purpose, form, audience, and criteria around their planned deliverables. This is a period of negotiation around products, the complexity of the learning, and the audience who will see the learning. This organizing tool pairs well with the Heat Map tool to help push the product or performance into a contemporary and authentic space.

DELIVERABLE CONSIDERATIONS

DELIVERABLE COMPONENTS:	STUDENT CONSIDERATIONS:	TEACHER CONSIDERATIONS:
<p>Purpose: The desired impact or reason for doing it in the first place.</p>	<ul style="list-style-type: none"> • Why are you doing it? • What kind of impact do you want your product or performance to have? 	<ul style="list-style-type: none"> • How can you continue connecting the learning at hand to the bigger goals?
<p>Form: The physical product or performance?</p>	<ul style="list-style-type: none"> • What is the genre, model, or style for your product or performance? • How does your product or performance follow the rules of the form? • To what extent did you break the rules? How might it impact purpose and audience? 	<ul style="list-style-type: none"> • To what extent are students comfortable with the rules of the genre, model, or style? • Can you show illustrative examples of different approaches that have different impacts for the audience?
<p>Audience: Who is going to view, listen to, play, or experience the form?</p>	<ul style="list-style-type: none"> • Who is going to see it? • Is it going to be published or presented to a larger audience? • How do you want to engage your audience? • What role can your audience have in continuing to make the result better? 	<ul style="list-style-type: none"> • What are the requirements for publication? (conference, competition, outside organization, etc.) • What are rules for audience engagement? How can you inform the audience ahead of time to focus their feedback on the learner's goals?
<p>Criteria: The learning outcomes by which the form and the process are being measured.</p>	<ul style="list-style-type: none"> • How do the key criteria guide your work? • Did any unwritten criteria become important to you? 	<ul style="list-style-type: none"> • What does quality look like? • How does quality directly connect to the learner goals?

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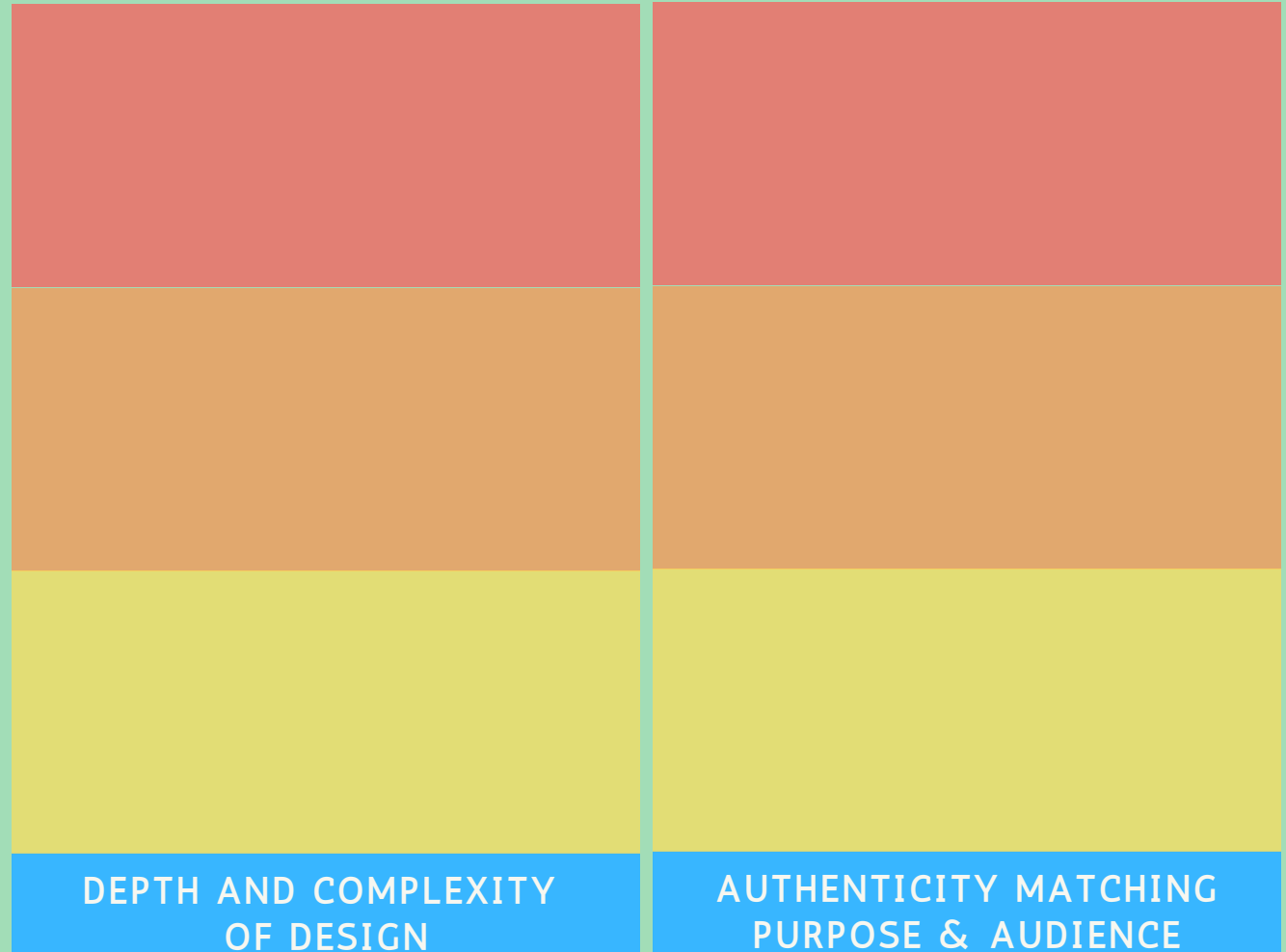
NOTES:

High Autonomy / Loose Design

High Autonomy / Tight Design
Low Autonomy / Loose Design

Low Autonomy / Tight Design

HEAT MAP



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NOTES:

Use the Feedback Processing organizer to help students sort their learning into concepts they know, concepts that they are familiar with but still need time to consider, and concepts that they are still actively learning. This helps them work smarter by letting them articulate the depth of their learning and shrinking their workload over time.

FEEDBACK PROCESSING

I KNOW THESE:

I NEED TO PRACTICE / WORK ON THESE:

I NEED TO FIND OUT MORE / LEARN THESE:

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NOTES:

This Ongoing Formative Assessment Rubric can be used throughout a learning experience to give comments and feedback about progression toward learning goals. It pairs well with both the Timeline and Action plan organizer and the Feedback Processing organizer to help students be more self-regulated and self-directed during the learning experience.

ONGOING FORMATIVE ASSESSMENT RUBRIC

Learning Target:

APPROACHING TARGET:	AT OR EXCEEDING TARGET:	DESCRIPTIVE FEEDBACK:

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