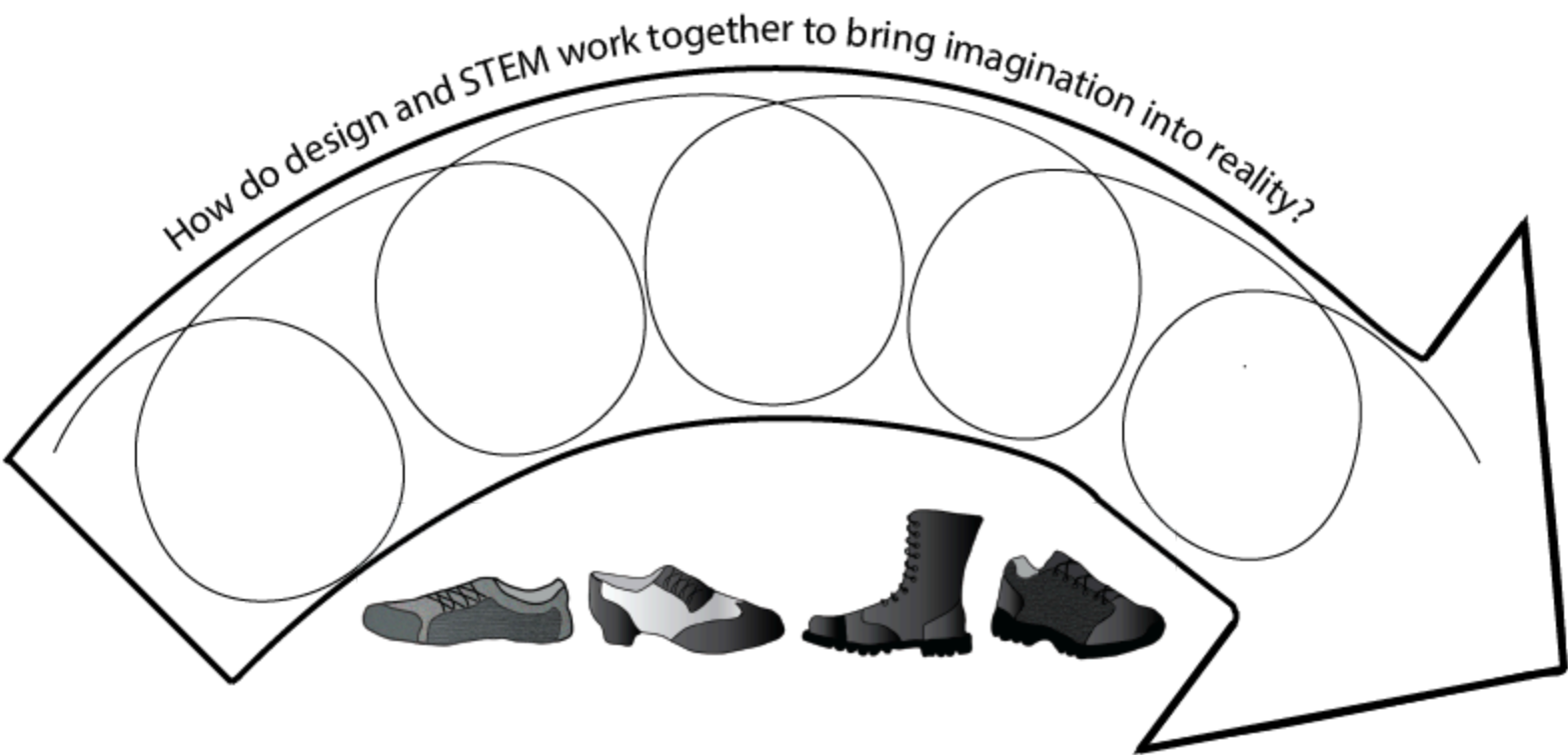
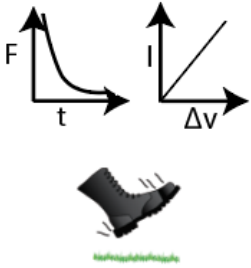
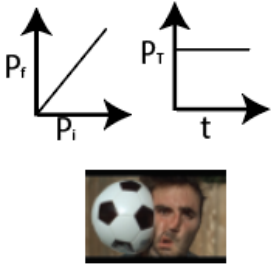
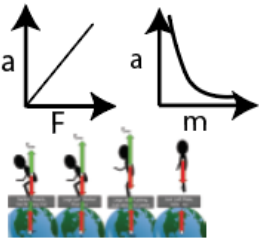


Student Calendar for Unit 4: Engineer a Shoe



Task Image Task Project Goal Dates	Should be able to answer this by the end of the task. Should be able to do this by the end of the task. What we did: Description of the prioritized learning task. Activities and Resources: 1. Links and references for the materials you need to complete the task. Homework *See additional resources at the bottom of the table.
 Exploring our Engineering Challenge Project Goal: Systematically frame and work through our new challenge of designing a shoe add_dates	What factors influence the design of a shoe? Be able to express in writing and orally the engineering design problem. What we did: Wel brainstormed and tinkered with some initial designs. Next, after researching our clients we determined the clients true priorities for the design. Activities and Resources: 1. Explore and begin Portfolio for Engineering a Shoe 4EP - Portfolio for Engineering A Shoe Introduce the Challenge Description and Requirements Read Client Profiles Design Priority Table Revise Problem Statement Homework In your Engineering Portfolio: Evaluate and refine your initial design in light of Client Profile Day in the life of an EMT video (ad-free version) Top 15 EMT boots article
 Exploratory Data Collection Project Goal: Tinker with shoes to get a feel for their characteristics. add_dates	What are the values or numbers involved with designing a shoe? Be able to express in writing and orally the values or numbers involved with designing a shoe? What we did: We took a quiz on Design Priority Tables about a new client. Then we began tinkering and taking measurements of our own shoes. Activities and Resources: 1. QUIZ: 4Q1 - Quiz on Obtaining, Evaluating, and Communicating Information 4P - Packet Engineering a Shoe Exploratory Data Collection page 3. Video Tutorials Cushioning set up for force plate 2:13 (ad-free version) Stability (ad-free version) Mass (ad-free version) Traction (ad-free version) 4. Discuss the interconnections between weight, mass, and g. Homework: None

 Experimenting with Traction and Cushioning to Investigate Impulse Project Goal: Model a Foot Strike as a means to determine how much cushioning is needed in a shoe. add_dates	How do we create a mathematical model for impact force? How do we utilize the mathematical model for impact force to better understand our world and make predictions about it too? Be able to express this model graphically, mathematically, visually, and verbally. Be able to utilize the mathematical model graphically, mathematically, visually, and verbally. What we did: We rotated between two experiments: one on the patterns with cushioning in a shoe and the other on one of the important patterns with shoe traction. Activities and Resources: 1. 4L1 - Lab Template for the Shoe Impact Investigation 2. Tutorial on setting up a Labquest 2 a. 4L1 - Interactive Notes with Graphs Pre-filled for Data Discussion for Shoe Impact Experiment 3. Applying the Big Ideas from Cushioning Experiment to our Larger World a. Practice with Impulse pages in the Packet Homework • Finish Practice with Impulse pages in the Packet
 Momentum Project Goal: Understand how shoes allow us to get moving and stop. add_dates	We have looked at shoes pushing off the ground (impact) in terms of force and time, how else can we look at characterizing this? Be able to express this new way of looking at impacts graphically, mathematically, visually, and verbally. What we did: We analyzed three different situations to learn about momentum. Activities and Resources: 1. Slow-mo Video Analysis -- Looking for Patterns 2. 4P - Packet Engineering a Shoe a. Interactive Notes for Momentum b. Explore, Extend, Elaborate Momentum Practice Homework • Find an example of how not mass, not velocity but the concept of MassVelocity (Momentum) is utilized or explains something in your life. Then document this with a picture or video.
 Newton's 2nd Law Jumping into Mathematically Modeling Newton's 2nd Law Project Goal: Mathematically modeling a foot strike to find how acceleration, mass, and net force are related. add_dates	How do we create a mathematical model for forces and acceleration? Be able to express those patterns graphically, mathematically, visually, and verbally. What we did: We took a deeper dive into how exactly things accelerate. Activities and Resources: 1. QUIZ: 4Q3 - Quiz on the Big Ideas of Momentum 2. Data Mining for Newton's Second Law a. 4L2 - Lab Template for Data Mining for Newton's Second Law b. Pages for "Data Discussion for Shoe Impact Experiment" in 4P - Packet Engineering a Shoe Homework • 4Reading - Data Mining for Drugs' Side Effects ◦ 4Reading - Questions on Data Mining for Drugs' Side Effects • Reading on the Physics of Vertical Leap
 Putting it all together in order to create an Evidence-Based Design of a Shoe Project Goal: Putting it all together, arguing from evidence and data-informed design decision making. add_dates	What is the value in data-informed decision making? How do we utilize our data to make data-informed design decisions? What is the impact of making data-informed design decisions beyond the shoe? What connected with you and made an impact today? How do you communicate data-informed decision making? How do we communicate data-informed design decisions? What type of sentence starters or sentence structure do you think will be helpful to communicate the impact of making data-informed design decisions? What was it about the impactful communication that connected with you? What we did: We created our final designs and reflected on the process. Activities and Resources: 1. QUIZ: 4Q4 - Quiz on the Big Ideas with Force and Acceleration 2. Use Market Research on Constraints for Clients to make your final design recommendation in 4EP - Portfolio for Engineering a Shoe. a. 4EP - Final Design of Shoe Template 3. Feedback and Revise Final Design 4. Recommendation with Rationale 5. Reflect on the Impacts of Science on the Design of a Shoe 6. QUIZ: 4Q5 - Quiz on Data-Informed Shoe Design 7. Gallery Walk Final Designs with * for Great Designs Homework • For Fun: What can you make a Jetpack out of?

Additional Resources:
[Patterns Physics Drive Folder](#)
[Career Connected Learning video with Intel Engineering/Destructive Testing](#) (curriculum integration coming)

For information on NGSS Performance Expectations, including which Science & Engineering Practices and Crosscutting Concepts are highlighted in the unit, see the:
[NGSS Alignment Matrix for the Patterns Physics](#)

ELP Standards:
9-12.1 - construct meaning from oral presentations and literary and informational text through grade-appropriate listening, reading, and viewing
9-12.2 - participate in grade-appropriate oral and written exchanges of information, ideas, and analyses, responding to peer, audience, or reader comments and questions
9-12.4 - construct grade-appropriate oral and written claims and support them with reasoning and evidence
9-12.5 - conduct research and evaluate and communicate findings to answer questions or solve problems
9-12.6 - analyze and critique the arguments of others orally and in writing
9-12.10 - make accurate use of standard English to communicate in grade-appropriate speech and writing

Unit Narrative (with Phenomenon):
Enduring Understandings:

Unit Essential Question: How do design and STEM work together to bring your imagination into reality?