

Introduction, Professional Careers, and Simple Machines

All referenced instructional resources are located within your curriculum course.

Teacher Learning Objectives

- LO1.1 Participants will learn to promote student-centered classrooms, identify possible student misconceptions, and reflect on their own teaching practices.
- LO1.2 Describe and distinguish among the disciplines of engineering and engineering technology.
- LO1.3 Develop strategies to facilitate active and engaging student learning.

Part 1: Guided Exploration of Instructional Resources Using the Introduction to Professional Careers

The first lesson of Principles of Engineering exposes students to careers in engineering and engineering technology by interviewing a practicing professional. In the units that follow, students will explore these specific career fields more deeply and compile a presentation on a specific engineering or engineering technology position. As you review these APBs, consider how these learning opportunities are best implemented.

PLTW's activity-, project-, and problem-based (APB) instructional approach centers on hands-on, real-world projects and problems that help students understand how the knowledge and skills they are developing in the classroom may be applied in everyday life. The APB approach scaffolds student learning, building the required skill sets to apply toward an open-ended design problem. As a PLTW Teacher, it is vital to develop an understanding of this instructional approach as you provide leadership in the classroom. The best way to develop your understanding is through hands-on exploration of the student experience.

Concept Exploration Procedure

Please use Part 1 of the Day 1 assignment submission form to document your progress.

1. As a cohort, your Master Teachers will guide you through the instructional resources structure of Lesson 1.1 Mechanisms. Key resources to locate and review include:

- a. Lesson 1.1 Mechanisms – Teacher Notes
 - b. Lesson 1.1 Mechanisms – Day-by-Day Plans
 - c. Lesson 1.1 Mechanisms – Understandings, Knowledge, and Skills
2. Building concept understanding
 - a. Master teachers will facilitate this first lesson that introduces students to careers in engineering and engineering technology.
 - i. Activity 1.1.0 Career Professional Interview
 - ii. 1.1.0.A CareersEngineeringEngineeringTechnology.ppt
 - iii. 1.1.0.A ProfessionalInterview.docx
 - iv. 1.1.0.A.RU ProfessionalInterviewRubric.doc
3. Exploring the student perspective
 - a. On your own, review
 - i. Activity 2.1.0 Career Field Description
 - ii. Activity 3.1.0 Career Demand, Salary, and Education
 - iii. Activity 4.1.0 Career Reflection, Abstract, Presentation



Submission Items

1. Document the navigation workflow within the course to locate the following resources:
 - a. Lesson 2.2 Materials Properties – Day-by-Day Plans
 - b. 2.2.TN Teacher Notes.docx
 - c. 2.1 Career Field Description
 - d. 4.1.RU CareerReflectionAbstractPresentationRubric.docx.

Part 2: Mechanisms – Simple Machines

The first lesson in Unit 1 of Principles of Engineering centers on mechanisms. Mechanisms are the basic components of most machines and consist of gears, sprockets, pulley systems, and simple machines. The effective use and understanding of mechanisms has contributed to the improvement and development of technology and society for thousands of years. In Lesson 1.1 Mechanisms, students will gain an understanding of mechanisms through the application of theory-based calculations accompanied by lab experimentation. In this assignment, you will walk through the first half of this lesson and be introduced to the concept of the Teacher as a Facilitator.

With the activity-, project-, problem-based (APB) instructional approach comes a shift in the paradigm of traditional classroom instruction. The role of the teacher changes from being a “presenter of information to a facilitator of a problem-solving process” (Lambros, 2002, p. 23). The APB approach also calls for students to be actively engaged in the learning process as they use their own curiosity and creativity and apply knowledge and skills to solve ill-structured problems. The idea of the teacher as facilitator shifts the focus to building on the knowledge base of students in ways that allow students to take ownership of learning. Rather than teacher-centered, the classroom becomes learner-centered. Students are actively engaged in developing understanding that can be applied in diverse settings.

Concept Exploration Procedure

Please use the corresponding assignment submission form to document your progress.

Part 2: Simple Machine Investigation

- Building conceptual understanding
 - Master teachers will facilitate an exploration of student resources:
 - Vernier®/Logger Pro® Introduction
 - DesignProcess2013.pptx
 - EngineeringNotebook.pptx
 - 1.1.1.A.a SimpleMachinesLeverWheelAndAxlePulley.pptx
 - 1.1.1.A.b SimpleMachinesInclinedPlaneWedgeScrew.pptx
 - 1.1.1.A.VEX.a SimpleMachineConst.pptx
- Skill building – Building with VEX®
 - On your own, review
 - Activity 1.1.1 Simple Machine Investigation
 - 1.1.1.A.VEX.b BuildingwithVEX.docx
 - 1.1.1.A.VEX.c IntroBuildingVEX.pdf
 - Use these resources to prepare your VEX kit and familiarize yourself with the components.
 - In small groups, discuss best practices for setting up Activity 1.1.1 Simple Machine Investigation in the classroom.
 - Identify any special considerations you should take to make sure the classroom environment is conducive to student learning.



Submission Items

1. Complete the First Class Lever and Second Class Lever procedural items of Activity 1.1.1 Simple Machine Investigation or your assigned simple machine and questions (for homework).

Part 3: Exploration of Teacher Resources

- In the previous assignment, you reviewed the following key resources:
 - Lesson 1.1 Mechanisms – Teacher Notes
 - Lesson 1.1 Mechanisms – Day-by-Day Plans
 - Lesson 1.1 Mechanisms – Understandings, Knowledge, and Skills
- Additionally, review Unit 1 Energy and Power – Lesson 1.1 Mechanisms curriculum framework.



Submission Items

Respond to the following based on your completion of Simple Machine Investigation:

1. Respond to Essential Question 3 (EQ3). (EQs are located in the Understandings, Knowledge, and Skills page of the teacher resources in each unit.)
2. Respond to Essential Question 4 (EQ4).
3. Identify possible student misconceptions related to the knowledge/skills addressed in this assignment. What ideas do you have for addressing these misconceptions?

Part 4: Gears, Pulleys, and Sprockets in Action

- Building conceptual understanding
 - In small groups, participants will review all related student and teacher resources for
 - Activity 1.1.3 Gears
 - Activity 1.1.4 Pulley Drives and Sprockets
- Learning the tools – Review of VEX components
 - Master Teachers will facilitate
 - Work on Activity 1.1.3 Gears
 - Work on Activity 1.1.4 Pulley Drives and Sprockets



Submission Items

1. Complete Student Activity 1.1.2 Simple Machine Practice Problems 15–18, 22–23, 31–38 (complete for homework). Review with a peer the next day before you compare with the Answer Key.
2. Work on Student Activity 1.1.5 Gears, Pulley Drives, and Sprockets Practice Problems 5–11

Classroom Implications

Throughout Core Training, questions are included that have implications for the classroom and for your work in providing implementation leadership at your school.

As you begin to preview the Principles of Engineering curriculum, pay particular attention to the role that each lesson component plays in facilitating student learning. Notice how the APBs scaffold content and skills in ways that enable students to obtain skills, make meaning, and ultimately transfer their knowledge.

1. What are some of the unique characteristics of problem-based learning? How do these characteristics currently appear in your classroom?

Read *The Teacher as a Facilitator of Learning* before you respond to the following questions:

2. When you reflect on your own practice, what are your strengths related to the role of the teacher as a facilitator of learning? What are the challenges and how can you address these challenges?
3. How do you think the APB instructional approach impacts the role of students? How is this like (or different from) what your students (or students in your school) are used to learning? What changes or shifts do you foresee as necessary for students as they work through a PLTW course? How can you as the teacher facilitate the change(s) necessary?

Trademark Attribution: PLTW, Project Lead The Way, and the PLTW logo are registered trademarks of Project Lead The Way, Inc. VEX and VEX Robotics are trademarks or service marks of Innovation First International, Inc. Vernier and Logger Pro are trademarks of Vernier Software & Technology, LLC. All other brand names, product names, or trademarks belong to their respective holders.