P R O J E C T D E S I G N : O V E R V I E W

Name of Project: Pick a Peck of Peaches		**Duration:** 5 days
Subject/Course: Science	**Teacher(s):** Michigan Agriculture in the Classroom	**Grade Level:** 3-5
Other subject areas to be included, if any: Technology use, math or English Language Arts (design research)		

Significant Content (CCSS and/or others)	This project utilizes student investigation and the engineering design process to design a tool for harvesting peaches. Next Generation Science Standards: 3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. 3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. 3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. *Incorporating requirements such as utilizing a magnet or simple machine (lever, pulley, wheel/axel, inclined plane, wedge and screw) could extend the reach of this lesson.*			
21st Century Competencies (to be taught and assessed)	Collaboration: Work in teams,		Creativity and Innovation: Device design, originality and inventiveness	
	Communication: In teams and with other adults		Other: Engineering design of harvesting device	
	Critical Thinking: Solve problems, evaluate evidence and make decisions			

Project Summary (include student role, issue, problem or challenge, action taken, and purpose/beneficiary)	Students will design a device to harvest peaches by evaluating existing harvesting methods for other fruits and answering the question "How can we design a piece of equipment or tool to harvest peaches while standing on the ground without bruising the fruit?" To answer the question, students will hear about American inventors Thomas Edison and Henry Ford to build understanding about the creativity and problem solving characteristics of inventors. Students will be introduced to the Engineering Design Process to investigate the needs of a farmer for harvesting and handling peaches. Students will examine existing harvesting equipment for apples, cherries, or other fruit, comparing and contrasting the characteristics of the fruits. While designing their invention, students will consider questions such as: How tall are peach trees? How heavy are peaches? How firmly can a peach be held before it bruises? How quickly do peaches need to be harvested? Can more than one peach be harvested at a time? Voice and Choice: Once the characteristics of peach harvest have been determined, students will design a prototype peach harvester (including structure, materials, electric or mechanic needs, etc.).	
Driving Question	How can we design a piece of equipment or tool to harvest peaches while standing on the ground without bruising the fruit?	
Entry Event	Read the book *The Inventor's Secret* by Suzanne Slade. View the following videos to observe peach, apple, cherry and blueberry harvesting methods. Apple: https://www.youtube.com/watch?v=1Bgyra_akeE&feature=youtu.be Blueberry: https://www.youtube.com/watch?v=3CTItsfpdOc Cherry: https://www.youtube.com/watch?v=9RsfkZy67Os Peach: https://www.youtube.com/watch?v=kOlqMDEIfU8	
Student voice and choice	Students will create a design on paper or digitally for a peach harvesting device. Then, students will make a prototype of this device in small scale. Creativity is encouraged and students should be able to make their own choices about materials used, source of materials and other decisions.	
Inquiry and Innovation	Students should be recording observations and questions about the structures of existing harvesting devices, needs of farmers and possible structures in their science journals (could be an electronic journal) as they make observations and watch videos.	
Products	Individual: Students will be active participants in their group. Students should have individual journal records.	Specific content and competencies to be assessed: A rubric will be used to assess group and individual work, as well as observations recorded in their ongoing science journal.
	Team: Teams will collaborate to design a plan for a peach harvesting device. Teams should be creative in making decisions about materials to use, method of device function, etc.	Specific content and competencies to be assessed: Students should demonstrate connections to the academic skills they are utilizing, including identification of the problem, predicting solutions to the problem and design and functionality of a prototype.

Feedback and revision:	Student teams will share their drawings and then prototypes with either their teacher and/or local fruit farmer who is invited into the class for feedback then will make revisions. A rubric will be used to guide feedback and final evaluation.	
Public Audience (Experts, audiences, or product user students will engage with during/at end of project)	Local agriculture representatives (orchard grower, equipment dealer, etc.), other students, possible display/demonstration at a school science fair, science night or open house.	
Resources Needed	On-site people, facilities, agriculture representative, possibly larger space such as a gym or media center for building prototypes,	
	Equipment: Computers/tablets	
	Materials: Science journals (digital or paper), *The Inventor's Secret* book, real, whole peaches, YouTube videos listed above and proper technology to show videos, Engineering Design Process diagram, chart paper or roll paper, rulers and/or tape measures, markers, crayons, colored pencils, or for a digital design, computers/tablets with MS word, Paint or other basic, age-appropriate drawing/design software, prototype materials, for smaller prototypes, could use pipe cleaners, paper clips, paper fasteners, spools, K'nex, etc with a ping pong ball or marble as "peach." For larger prototypes, coat hangers, pvc pipe, brooms, grocery bags, fabric, etc. could be used with a tennis ball to represent the peach.	
	Community Resources: Local agriculture industry professional engaged in raising fruit or selling/servicing orchard equipment.	

Reflection Methods (Individual, Team, and/or Whole Class)	Journal/Learning Log: ongoing science journal		Focus Group	
	Whole-Class Discussion: Yes		Fishbowl Discussion	
	Survey		Other: Peach harvester design plan and prototype	

Notes:

Procedures: Prior to beginning, make arrangements with a local agriculture industry representative to be present for mid-project feedback and final project results. Also, gain approval to use computer labs for digital design and/or gym/media center for building days, if desired. Gather all necessary supplies and be sure students have their science journals accessible.

Day 1:
1. Read *The Inventor's Secret* by Suzanne Slade. Ask students to reflect on the elements of invention in the story. Tell students we are also going to be agricultural inventors, showing students a few real, whole peaches.

2. Engineering Design Process Step One, Ask:
Ask students to predict how they think peaches grow and are harvested? *(record predictions on board or digital list for whole class to see, after predictions, show video of peaches growing)* How are other tree fruits harvested? *(Show videos listed above of fruit harvest).* How are peaches similar or different from these other fruits in growing and harvesting? How could we design a tool or machine to harvest peaches?

Explain to students which size prototype you'll be building, either full size or a miniature version and why. Also consider setting out examples of prototype building materials prior to introducing step two so students can brainstorm materials needed.

3. Engineering Design Process Step Two, Imagine:
Divide students into lab groups to brainstorm solutions. If available, allow students to utilize tablets or computers for research and/or provide links to videos shown so students could re-watch existing designs *(record brainstorming in science journals).*

4. Engineering Design Process Step Three, Plan:
Provide students with blank paper and drawing materials to create prototype design drawings, including lists of materials. Invite local orchard owner or other agricultural professional in to observe prototype drawings and provide feedback *(Coach agricultural professional on how to assist with age-appropriate, simple feedback for students).* Students should make adjustments to their drawings as needed with the help of the agricultural professional and teacher.

Day 2:

Engineering Design Process Step Four, Create:
Allow students to utilize their drawings or digital designs to build their prototype! *(this could be completed over several days, or just one depending on schedules)* Students should be testing their tool/machine as they build.

Day 3:

Engineering Design Process Step Five Improve:
Invite the same local orchard owner or other agricultural professional in to observe prototype demonstrations. Each group of students should make a brief presentation in front of the whole class demonstrating the use of their prototype. Agricultural professional, teacher and other students could ask questions and provide constructive feedback to each group. *(Coach agricultural professional prior to presentations on how to assist with age-appropriate, simple feedback for students)* Be sure students are taking notes in their science journals as to what could be improved.

Day 4:

Engineering Design Process Step Five Improve (continued):
Based on demonstration feedback and discussion, allow students time to test improvements to their design.

Engineering Design Process elementary interpretation is adapted from: Engineering is Elementary, Museum of Science, Boston
www.eie.org/overview/engineering-design-process

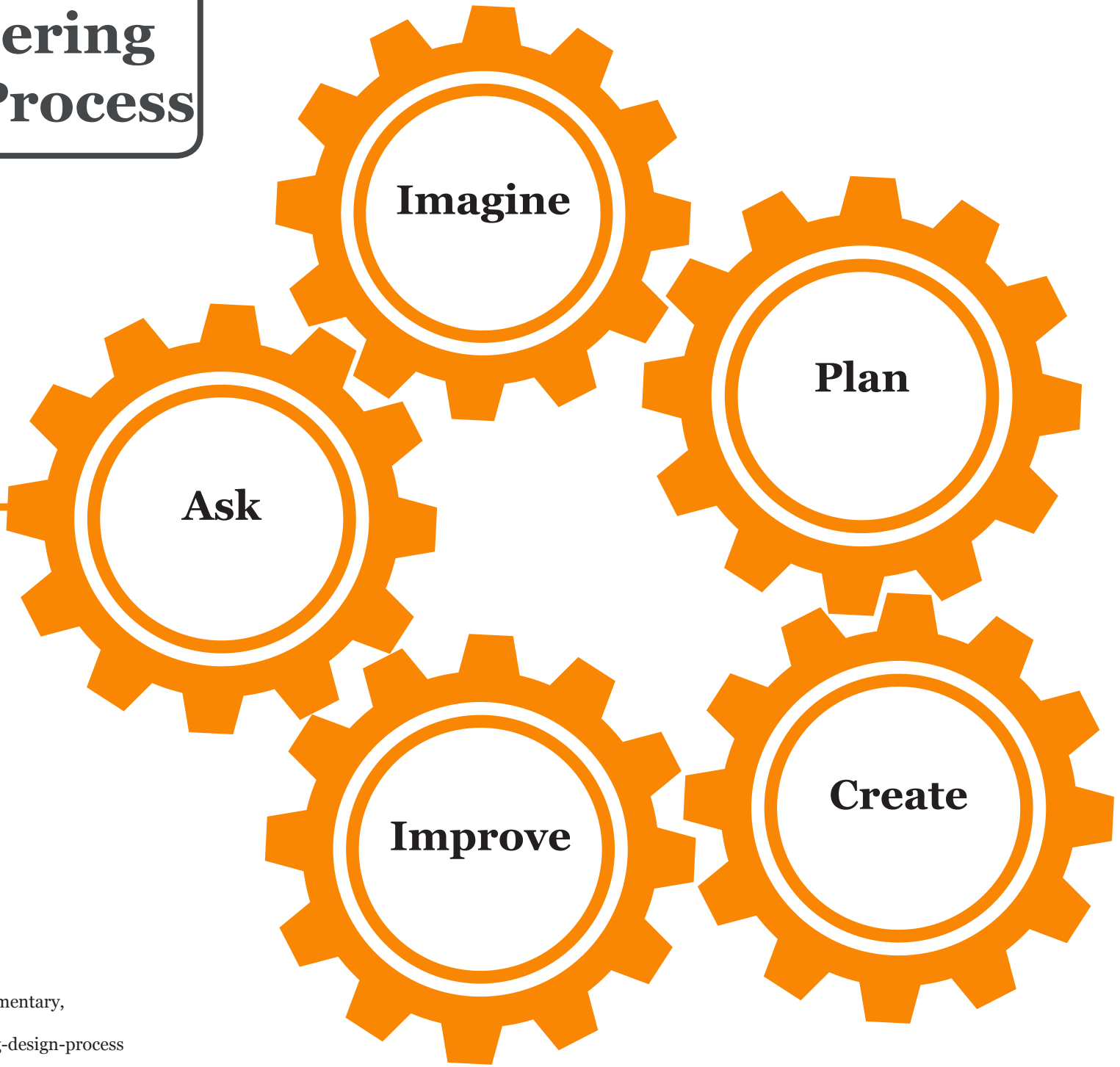
PROJECT DESIGN: STUDENT LEARNING GUIDE

Project: Pick a Peck of Peaches

Driving Question: How can we design a piece of equipment or tool to harvest peaches while standing on the ground without bruising the fruit?

Final Product(s) Presentations, Performances, Products and/or Services	**Learning Outcomes/Targets** content & 21st century competencies needed by students to successfully complete products	**Checkpoints/Formative Assessments** to check for learning and ensure students are on track	**Instructional Strategies for All Learners** provided by teacher, other staff, experts; includes scaffolds, materials, lessons aligned to learning outcomes and formative assessments
(individual **and** team) Each individual will have a complete Science Journal section including notes on each step of the Engineering Design Process. Specifically notes should include ideas for prototype build. Individuals will be active participants in all group work. Each team will design harvesting prototype and present this to the entire class and other invited community members.	Communicates and cooperates well with other team members. Contributes to team's project throughout all steps.	Individual science journal records	Reading comprehension in Day 1 activity utilizing story book. Possible incorporate of other simple machines or magnets to further demonstrate application of science principles.
	Includes appropriate correlations to identifying problem, devising a solution considering constraints and materials.	Review with editing by agriculture representative	Constructive feedback from industry review(agriculture representative)
	Utilizes feasible materials, methods and design for prototype.	Final presentation to class and guests	
	Demonstrates appropriate use of resources provided, including but not limited to: chart paper, markers, computers, building materials, etc.		

Engineering Design Process



Michigan Agriculture in the Classroom

Adapted from: Engineeering is Elementary,
Museum of Science, Boston
www.eie.org/overview/engineering-design-process