

IISME Educational Transfer Plan

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Improve an Existing Lesson
Physics 9-12
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LUNAR EGG MODULE

0. Abstract

The goal of this ETP is to expose students to the industry project management procedures while working on the classic Egg Drop Project in a Physics Classroom. Students will follow the procedures of project management, similar to what was observed at Blach Construction, to design a vehicle, which has to be constructed as per the directions given including certain constraints, which can to used to drop an egg from an assigned height without breaking it. Students will present to the class describing why they think that their design will succeed in saving the egg. Students will also submit a written report about their project which will include drawing and journal entries for their project as well. Finally students will test out their egg drop vehicles by dropping them from football bleachers at school and reflect on the results.

I. Standards/Skills/Objectives/Assessment

1. Target 21st Century Skill:

P 21: Critical Thinking and Problem Solving
Students will be able to design a solution for a given problem which includes certain constraints in terms of materials that can be used and how much time is given to complete the project.

2. Measurable Objective(s):

1. Students will be able to chronicle and describe their thinking process (including drawings) to show how they arrived at their final design for the egg drop vehicle.

2. Students will be able to explain to the class in a 2-3 minutes presentation why they think that their vehicle will be successful in keeping the egg intact by applying concepts of impulse and impact force.

3. Students will be able to build a final project that can be tested by dropping the egg in the vehicle they designed and reflect on it's success or limitations.

3. Assessment:

Formative: There will be multiple checkpoints along the way and students have to finish their project in a timely manner.
Summative: Students will be assessed using a teacher generated rubric which includes sections for the design, class presentation, and testing the egg drop vehicle in the field.

4. Additional Standards

Students will work in pairs to design their egg drop vehicle. This is connected to the 21st century skills of Communication and Collaboration.

II. Fellowship Connections

1. 21st Century Skill(s):*(Exempt)*

2. 21st Century Skill(s) Application: *(Exempt)*

3. Fellowship Description:

My fellowship is at a local construction company. I am part of a construction team which includes a project manager, project engineer, project coordinator, superintendent, and several foremen. The project involves replacing the roofs and HVAC mechanical upgrades at multiple elementary and middle schools for a local school district. In any construction project, three critical elements are – timely completion, cost effectiveness and quality product. Since this project relates to schools, it is imperative that it is finished in a timely manner. Also, this project involves renovating existing structures, there are some additional challenges. As the old structures and equipments are being removed, some additional issues are coming to light which were not detailed in the original scope of work. So the list of constraints is very dynamic and keeps changing on a daily basis. The construction team has to constantly discuss these issues with all the stakeholders and keep proposing possible solutions. Site plans are changed as needed and new solutions are implemented quickly. As part of this team I am learning how to analyze a problem and come up with a solution while collaborating with your team

4. Fellowship Connection to School/Classroom:

The egg drop project that the students will be working on will have a list of constraints in terms of size of the vehicle and what kind of materials can or cannot be used to construct it. Students will be required to consider different options and justify why they used a particular option. There will be multiple checkpoints along the way and students have to finish their project in a timely manner.

END Proposal!

III. Instruction

1. Instructional Plan:

LUNAR EGG MODULE (LEM) PROJECT: Instructional Plan

Time required: (3 50 minute periods, and 1 90 minute block)

Note: This project could be assigned in any physics class room towards the end of the first semester. Following topics need to be covered before assigning the project – Two Dimensional Kinematics, Force and Newton's Laws of Motion, Concept of Friction and Drag, Uniform Circular Motion and Gravitation, Linear Momentum and Collisions, Rotational Motion and Angular Momentum

Week-1, Day 1 (50 minute period)

1. Introduce students to the term "Project Management". Make a list of the information that they share on the whiteboard. Summarize their ideas.
2. Share your experience of working as an IISME fellow. I worked at a construction company (you can use your own company as an example also). Go over the information in the attached power point. Share your personal experience of working as part of a team in a company outside of the school setting. Share videos/pictures if you have them to get the kids interested and curious.
3. Emphasize that the three key components in project management in general and construction industry in particular are quality of the finished product, timely completion and managing the budget effectively.
4. Now talk about how we can use these project management ideas in our physics classroom.
5. Introduce the Lunar Egg Module. Talk about the space crafts' landings on moon and mars and how it is important that the space crafts are able to land without damaging the contents.
https://www.youtube.com/watch?v=qEdn33Aj8dw (Mars Rover touches down on the red planet)
https://www.youtube.com/watch?v=sTBIr65cL_E (Landing on the Moon-July 20, 1969)
6. Pass out the Student Handout for the project and go over the listed constraints in details.
7. Pass out all the other handouts.
8. Students will be working in groups of two. They can pick their own groups or the teacher may assign them.
9. In the first week reserve 5-7 minutes of each class period to answer student questions about the project.

Week-2, Day 2

- Check that students have completed at least two journal entries about their design process.
- Stamp/record student work

Week-3, Day 3

- Students will be able to test their projects today. Have some weighing scales and rulers available so that they can mass and measure their LEMs. Walk over to a test area. For my classroom, students will be able to climb up the adjoining staircase and drop their LEMs from the top of the staircase to check.
- Students can get multiple eggs (in separate Ziploc bags) to test their LEMs multiple times

Week-4 , Day 4

· Class presentations: Students will explain and justify how they designed their LEMs. Students can ask questions from the group that is presenting.

Week-4, Day -5

· Launch Day.

· Pass out or set up the weighing scales so that each group could mass their LEMs. Students will also measure and write the dimensions of their LEMs on the data sheet

· Walk over to the bleachers. Set up the launch area.

· Drop a heavy mass from the launch pad and mark that spot. That is the target spot for each LEM to fall on.

· Let the students stand on the ground. Call each group one at a time to go up on the bleachers to test their LEMs.

· Keep some paper towels handy in case of a spill.

Assessment

Formative:

Checking journal entries

Test Day Observations and Modifications (Handout Attached)

Summative:

Written Report (Handout and Rubric Attached)

Class Presentation (Handout and Rubric Attached)

2. Additional Instructional Context:

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3. Supply List:

- Scissors
- Tape/Glue
- Rulers
- Weighing Scale
- One 3 cm loop of wire for each pair.
- Paper towels
- Ziploc sandwich bags
- Copies of the following handouts (See links in attachments)
    - Student Handout (1 per student)
    - Expected Contents of the Written Report (1 per student)
    - Written Report Rubric (1 per pair)
    - Presentation Details and Rubric (1 per pair)
    - Launch Day Details (1 per pair)
    - Test Day Observations and Modifications (1 per pair)

4. Bibliography:

"STEM for Kids: Egg Drop Project - Buggy and Buddy." *Buggy and Buddy*. N.p., 2016. Web. 26 July 2016.

Onemeeeliondollars. "1st Place Egg Drop Project Ideas- Using SCIENCE." *YouTube*. YouTube, 2015. Web. 26 July 2016.

H., Haneen. "The Physics Behind the Egg Drop." *Prezi.com*. N.p., n.d. Web. 26 July 2016.

"The Physics of an Egg Drop." *Myfavoritekindofcrazy.com*. N.p., n.d. Web. 26 July 2016.

"Egg Drop." *Egg Drop*. N.p., n.d. Web. 26 July 2016.

5. Keywords:

Physics, project, egg drop, lunar module,

IV. Attachments

Construction Project Management Powerpoint Presentation
Student Handout
Journal Entry Template
Expected Contents of the Written Report
Written Report Rubric
Presentation Details and Rubric
Test Day Observations and Modifications
Launch Day Details