



Winter Paralympics

Submitted by: Lisa Hill, Physical Science
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Target Grade: Physical Science

Time Required: three 75 minute class periods

Standards:

3202. T/E.2 Apply the engineering design process to construct a prototype that meets developmentally appropriate specifications.

Lesson Objectives:

Students will design a luge sled prototype for a Paralympic athlete.

Central Focus:

Society benefits when engineers apply scientific discoveries to design materials and process that develop into enabling technologies. Because there currently is not a luge event offered for Paralympic athletes, students are challenged to design a novel luge sled that meets an athlete's specific classification.

Background Information:

The 2018 PyeongChang Olympics will have the following events available to Paralympic athletes: Alpine Skiing, Biathlon/Cross Country Skiing, Ice Hockey, Snowboarding, and Wheelchair Curling. Currently, there is not a Luge event for Paralympic athletes.

Materials

- student tablets/devices with internet connection
- teacher computer and projector
- writing utensil and notebook paper
- large sheets of paper for final drawing
- list of 2018 Winter Olympic events
- list of 2018 Paralympic events
- individual performance in group work evaluation form
- portfolio handouts
- colored pencils and markers



Day 1 (75 minutes)

Introduction (15 minutes)

Teacher will:

1. announce the objective and distribute the Engineering Design Process Hand-out (see end of lesson)
2. explain that the class will compare and contrast the sporting events available to athletes for the 2018 Winter Olympics and the 2018 Winter Paralympics games as part of the research phase of the Engineer Design Process

Students will:

- 1.) list sporting events of 2018 Winter Olympics in their portfolios without aid from the internet; then use their devices to verify and add additional events via Internet search
- 2.) list sporting events of 2018 Winter Paralympics in their portfolios without aid from the internet; then use their devices to verify and add additional events via Internet search

Teacher will lead class discussion comparing and contrasting the events in the 2018 Winter Olympics and Paralympics. Students should notice that there is not a luge event in the Paralympics.

Activity (30 minutes)

Teacher will assign groups and assign a topic to each group. (Listed below, a-h)

- a.) History of Paralympics/ What is the IPC?
- b.) Classification of athletes
- c.) Para alpine skiing (include specialized equipment needed)
- d.) Para ice hockey (include specialized equipment needed)
- e.) Para biathlon (include specialized equipment needed)
- f.) Para Snowboard (include specialized equipment needed)
- g.) Para cross-country skiing (include specialized equipment needed)
- h.) Wheel chair curling (include specialized equipment needed)

Students will research the Paralympics (paralympic.org) according to their assigned topics and will write a summary of their research to collect in their portfolios.

Closure (30 minutes)

Students will present their summary to the class and lead a discussion about presentations. Students will ask each other questions and discuss personal relevancy. Teacher will scaffold students using questions: What specialized equipment is used and why is it important? Do you think there are other paraplegic sports events need specialized equipment? Who designs this equipment? How do you think they design it?



Day 2 (75 minutes)

Introduction (15 minutes)

Teacher will refer back to the objective from 1st class period.

Students will recap previous day's presentations, focusing on the classification of athletes.

Teacher will pose the guiding question for the day: How can you design a luge sled for a Paralympic athlete?

Procedure (35 minutes)

Teacher will explain that student groups will select a hypothetical classification of a Paralympic athlete. Classification must be detailed. Then, students will design a luge sled for this athlete. In order to do this, students must research both classifications and the luge sled before they can design the sled. From the EDP, this will be the questioning, research, and brainstorm phase.

Individually, students will use their tablets to:

1. research and choose a hypothetical classification
2. research the luge sporting event
3. brainstorm ideas for a luge sled
4. collect their research and write their ideas down to put into their portfolios

Closure (25 minutes)

Groups will review their research with each other and discuss ways to design a luge sled for their chosen Paralympic classification. Students are encouraged to continue their research and to brainstorm outside of class.

Day 3 (75 Minutes)

Introduction (10 minutes)

Teacher will restate the objectives as from 1st class period.

Groups will review and discuss their previous day's Luge research.

Procedure (35 minutes)

Teacher will introduce the challenge of producing a schematic drawing of a luge sled.

This drawing must meet the requirements of the selected classification of athlete.

Teacher will explain that the High School Project Poster Rubric can help guide the presentation of the drawing. Teacher will explain we are now in the planning phase of EDP.



Students will spend 30 minutes creating a schematic drawing of their sled based on their designs and research. Students will be reminded that the sled must meet specific requirements.

Closure (30 minutes)

Students will

1. tape their drawings around the classroom
2. spend 10 minutes looking at the other group's drawings
3. spend 15 minutes writing a 1 page summary and reflection about the entire lesson
4. make sure all documents are included in their portfolios
5. evaluate their own portfolios (see "2018 Paralympics Luge Sled Design Portfolio Table of Contents" below)
6. submit their portfolios for teacher evaluation

Differentiation

Students will be grouped in mixed ability levels. Individuals are assigned specific assignments- recorder, materials manager, researcher manager, EDP supervisor.

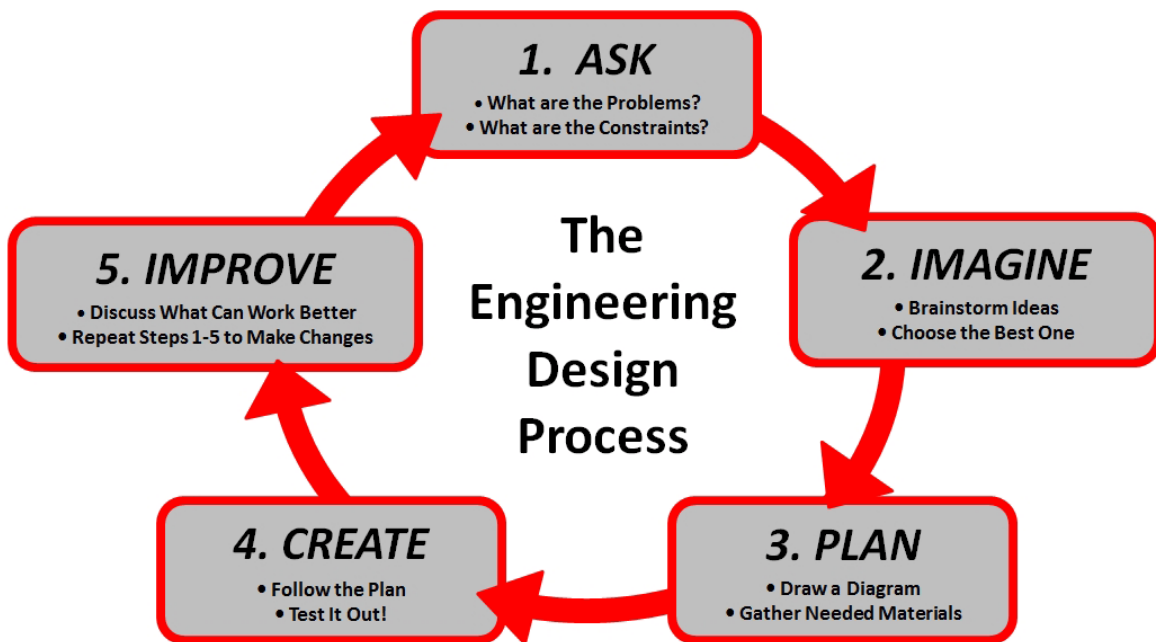
Assessment

1. Formative assessment throughout the lessons. Teacher will evaluate via questioning to determine if students are associating their work with the engineering design process.
2. Performance based assessment of individual student portfolios. Students will be scored based on the quality of work collected. High quality work includes in depth research and notes. Students will also be scored on the completion of the portfolio.
3. Summative assessment of the lesson summary/reflection paper. Teacher will evaluate whether students have applied the engineering design process to construct a schematic drawing that meets developmentally appropriate specifications.
4. Summative assessment of schematic drawing where judges evaluate each design using the High School Project Poster Rubric. Teacher will assess whether students have designed a luge sled that meets specific requirements.

2018 Paralympics Luge Sled Design Portfolio

Table of Contents

| Date | Page Number | Content Description | Student Evaluation | Teacher Evaluation |
|------|-------------|---|--------------------|--------------------|
| | 1 | List of 2018 Winter Olympics and Paralympics Events | | |
| | 2 | Notes and summary of Paralympic assigned topic | | |
| | 3 | Research notes on the luge event including references | | |
| | 4 | EDP step by step design reference handout with design notes | | |
| | 5 | Copy of group's final design | | |
| | 6 | Lesson summary/reflection | | |
| | 7 | Peer Evaluations (guidelines for group work) | | |



High School Project Poster Rubric

| | Criteria | | | Points |
|-------------------------------|--|--|---|--------|
| | 3 | 2 | 1 | |
| Colors and patterns | Enhance readability. | Support readability. | Detract from readability. | |
| Layout | Creatively enhances information. | Balanced, uncluttered, adequate white space. | Not balanced, cluttered, insufficient white space. | |
| Graphics/photos | All graphics are engaging, enhance text. | Graphics enhance text. | Graphics do not enhance text. | |
| Titles and subtitles | All titles and subtitles are clear, enhance readability | Most titles and subtitles are clear, enhance readability | Few or no titles or subtitles to clarify text | |
| Text size and color | All text is clear and readable; a few changes in size and color enhance understanding. | Text is clear and readable; changes in size and color enhance understanding. | Some text is clear and readable; frequent changes in size and color do not enhance understanding. | |
| Writing | Well written and organized, clear, easy to follow. | Adequately written and organized, clear, reasonably easy to follow. | Poorly written and organized, unclear, hard to follow. | |
| Quality of information | Product description is clear, complete and concise. | Product description is mostly clear, could be a little more concise. | Product description is unclear, incomplete and not concise. | |
| Grammar and spelling | No grammar or spelling errors. | One grammar or spelling error. | Many grammar and spelling errors. | |
| | | | Total | |

Guidelines for Group Work

Name: _____

Date: _____

| I Can ... | Most of the time (5 or more examples) | Some times (3-4 examples) | A little bit (1-2 examples) | Not at all (0 examples) |
|--|---|------------------------------|--------------------------------|----------------------------|
| listen to every member of my group | | | | |
| encourage others to share and consider their ideas | | | | |
| speak up when I am confused or need help. | | | | |
| give my help to others | | | | |
| keep working until every member of my team agrees on a solution. | | | | |