

Marble Lift

Students will experience first hand the steps required to engineer a product. The product will require a series of skills in combination: research, design and development testing/experimenting, problem solving, teamwork, construction, Computer Aided Drafting word processing and public speaking skills.

Curriculum/State Standard

Pennsylvania State Standards:
 3.1.12. A, B & D Unifying Themes;
 3.6.12. B & C Technology;
 3.7.12. A & D Technological Devices

Overview

Problem: Design and construct a lift mechanism that will transport marbles to a specific unloading area and unload them. The unloading platform will be 12" above the base of the finished project and will feed the marbles to a bucket below. The project that transports the most marbles in a three minute period will be rated the most efficient. Only those marbles in the bucket will be counted. These projects will be used to compete against other schools in a local engineering competition. Projects not complying with competition specifications/rules will be disqualified.

Objectives

- The student will be able to demonstrate Internet research and make reference to these results in a written report.
- The student will be able to sketch then use Computer Aided Drafting skills to draw the solution to the problem. Sketches and CAD drawings will be included in a final report.
- The students will be able to demonstrate teamwork to complete the project.
- The student will demonstrate the efficiency of their device in a competitive environment.
- The student will demonstrate the ability to make major/minor changes so their project will meet competition specifications and perform.
- The student will demonstrate word processing skills by completing a daily summary sheet and a word processed report addressing specific criteria.

Continued on the back...

11-12

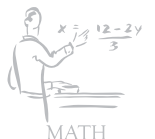
GRADE LEVEL



ARTS



LANGUAGE



MATH

Misc

MISCELLANEOUS



SCIENCE



HISTORY



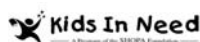
SOCIAL STUDIES

4

MONTHS

\$1000

TOTAL BUDGET



THIS WINNING LESSON PLAN WAS SUBMITTED BY:

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“Marble Lift” project continued...

- The student will demonstrate the ability to follow a timeline and meet a deadline.
- The student will demonstrate the ability to make an oral presentation in a competitive environment.

Materials

K'nex kits for testing and experimentation purposes. Any other materials that can be used as a substitute for the K'nex components in the final project.

A small electric motor and gear set provided by the competition committee.

Readiness Activity

Introduce the competition, project/specifications, rules and requirements.

Strategies/Activities

- Introduce competition, project/specifications and requirements (handout).
- Brainstorm possible solutions and suggestions to solve the problem as a class.
- Allow students to pick teams.
- Students start daily summaries to be used as part of final report.
- Teams begin researching their solutions to the problem.
- Teacher lecture and demonstration on design solutions.
- Students sketch possible solutions to the problem.
- Teacher meets with teams to discuss/evaluate sketch solutions.
- Students design project using Computer Aided Drawing software that includes a minimum of a top, front and right side view, plus any other view that will make the project clear to construct.
- Students construct, test, and modify models made from K'nex.
- Students modify K'nex models until they perform.
- Students make changes on CAD drawings if needed to match K'nex models.
- Students dimension locations of key components of their device (axle holes, motor location etc.) (K'nex pieces may not be used in the finished structure of the final project. K'nex are used only for testing and experimentation.)
- Students substitute other materials to replace the K'nex components in their CAD drawings, keeping key component locations in place.
- Students construct final project using substitute materials.
- Students test and modify finished project for performance.
- Students modify CAD drawings to match finished project.
- Students receive handout on final report requirements.
- Students complete final report, addressing specific criteria.
- Students submit sketches, technical drawings, daily reports and a final report with the finished project for the competition.
- Students prepare for oral presentations.
- Students compete against other local schools.

Culminating Activity

Students competed against other local schools in the Technology Ingenuity Challenge sponsored in great part by The Erie Engineering Societies, The Erie Civil Engineering Council, The Northwest Intermediate Unit #5, The Technology Education Association of Northwestern Pennsylvania, and The Erie Society of Manufacturing Engineers. The competition included project performance, technical drawing performance, oral/written presentations and craftsmanship awards. All performances have to meet specifications established by the competition committee.

Evaluation

Professors from Edinboro University of Pennsylvania, local engineers, and teachers used rubrics for each of the following evaluations:

Project evaluation - meets competition specifications and performance - how many marbles are placed in the bucket during a three-minute period.

Technical drawing - did the student follow standard drawing procedures and techniques.

Oral and Written Presentation - did the student address specific requirements oral and written.

Craftsmanship - is the project constructed according to the technical drawings.