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I would hope we taught students the importance of seeing a project through to the end and the importance of good team work in solving a problem.

Hot Air Balloons

The Idea

This interdisciplinary activity involves students of varying ability levels in five curricular areas: physics, technology, math, history and communications in a fun, exciting hands-on learning project. Fundamental principles of flight and design are presented in a cross-curricular, integrated, contextual approach that provides for students success in linking classroom theory and real-life application.

This project is a result of Tech Prep Building Application Teams mini-grants. The excitement and team spirit that this project has generated in students and staff has provided the impetus for the development of similar integrated projects over the last several years. A similar project resulted in TF North High School receiving the "Jordan Fundamentals Grant" for the instructional creativity and non-traditional approach a thematic unit demonstrates in raising students' academic achievement and interest.

This project will result in:

- Understanding how to create and administer an interdisciplinary project that integrates the curriculum of math, science, history, technology and media;
- Showing students a link between classroom theory and practical application; and
- Motivating students to develop investigative skills, stimulate curiosity, strengthen problem-solving abilities and build confidence to communicate their discoveries.

Impact

This project was the first of its kind for many students. We hoped the things learned in completing the project would help students better understand the problem-solving and engineering process. Future projects showed us the students did learn and learn to use this process.

Logistics

- In what career and technical educational program area did this project or activity take place?
  Technology Education
- What were the topic areas covered by this project?
  Mathematics, Science and Technology
- What grade level did this project address?
  9–12
- How much did this project cost?
  This project cost about $300 to begin, but many of the materials are reusable.
- How much time is needed to prepare for this activity?
  3–5 hours
- How much time is needed to deliver this project?
  6–10 hours
- How was the project delivered?
  This is a group activity.
- Please describe any necessary professional development needed to present and use this project.
  The only professional development would be an understanding of some basic science and physics

principles along with how to proceed with a group project.

- How was the curriculum for this project secured?
  It was developed.
- What national, state or local standards were addressed by this project?
  This project addresses many standards, including:

ITEA Standard
Design Standard 3

- Students will develop an understanding of the attributes of design.
- Students will develop an understanding of engineering design.
- Students will develop an understanding of the role troubleshooting, research and development, invention and innovation and experimentation in problem solving.

Abilities for a Technological World Standard 4

- Students will develop the abilities to apply the design process.
- Students will develop the abilities to assess the impact of products and systems.

Subject Matter Standards for Technology Education

- Standard 1—The Nature of Technology
- Standard 2—Technology and Society
- Standard 3—Design
- Standard 4—Abilities for a Technological World
- Standard 5—The Designed World
- Standard 8— Students will develop an understanding of the attributes of design.

  The design process includes defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.

  - Design problems are seldom presented in a clearly defined form.
  - The design needs to be continually checked and critiqued, and the ideas of the design must be redefined and improved.
  - Requirements of a design, such as criteria, constraints, and efficacy, sometimes compete with each other.

Standard 9—Students will develop an understanding of engineering design.

Established design principles are used to evaluate existing designs, to collect data, and to guide the design process.

- Engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
- A prototype is a working model used to test a design concept by making actual observations and necessary adjustments.
- The process of engineering design takes into account a number of factors.

Standard 10—Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.

Research and development is a specific problem-solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.

- Technological problems must be researched before they can be solved.
- Not all problems are technological, and not every problem can be solved using technology.

Standard 11—Students will develop abilities to apply the design process.

Identify the design problem to solve and decide whether or not to address it.

- Identify criteria and constraints and determine how these will affect the design process.
- Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.
- Evaluate the design solution using conceptual, physical and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.

- Develop and produce a product or system using a design process.
- Evaluate final solutions and communicate observation, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual and written means in addition to the three-dimensional models.

- Was this project linked to improving technical skills?
  Yes, it was. The use of technology was used throughout the project. Students used software to conduct simulated launch conditions to perfect their designs.
- Was this project linked to improving academic skills?
  Yes, it was. The number one skill stressed was problem solving. Students needed to construct a clear plan of attack in their design process. The entire engineering process was introduced and followed by students.
- Was this project linked to improving workforce readiness skills?
  Yes, it was. I would hope we taught students the importance of seeing a project through to the end and the importance of good team work in solving a problem.
- Do you know of any other practitioners/teachers who have used this project?
  Yes. This project has been used by the math, science and technology departments at TF North for many years now. I have introduced the project to many instructors over the years and have received positive feedback from many of them.