GEORGIA | PEACH STATE PATHWAYS

Career, Technical, & Agricultural Education

ENGINEERING & TECHNOLOGY

COURSE: Engineering Applications (ET-EA)

UNIT: 6. Engineering Business and Marketing

INTRODUCTION

Annotation:

In this unit, students will understand the business side of engineering, and that simply creating a product is not good enough for companies. Students will learn that whatever is made needs to be marketable and profitable. They will learn to make decisions based on cost analysis and marketing surveys.

Grade(s):

	9th
	10th
X	11th
X	12th

Time:

20 days

Author:

Matthew Flanders

Students with Disabilities:

For students with disabilities, the instructor should refer to the student's IEP to be sure that the accommodations specified are being provided. Instructors should also familiarize themselves with the provisions of Behavior Intervention Plans that may be part of a student's IEP. Frequent consultation with a student's special education instructor will be beneficial in providing appropriate differentiation.

FOCUS STANDARDS

GPS Focus Standards: Please list the standard and elements covered.

- ENGR-EA-4 – Students will explain the impact of business and marketing on engineering design.
- ENGR-EA-5 – Students will identify the impacts of social, economic, and environmental issues on the engineering design process.
- ENGR-STEM-3 – Students will design technological problem solutions using scientific investigation, analysis and interpretation of data, innovation invention, and fabrication while considering economic, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability constraints.
- ENGR-STEM-6 – Students will enhance reading by developing vocabulary and comprehension skills associated with text materials, problem descriptions, and laboratory activities associated with engineering and technology education.
- CTAE-FS-3 – Communications: Learners use various communication skills in expressing and interpreting information.
- CTAE-FS-5 – Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.
- CTAE-FS-6 – Systems: Learners understand a variety of organizational structures and functions.
- CTAE-FS-8 – Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.
- CTAE-FS-11 – Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.

GPS Academic Standards:

National / Local Standards / Industry / ISTE:

UNDERSTANDINGS & GOALS

Enduring Understandings: Enduring understandings are statements summarizing important ideas and have lasting value beyond the classroom. They synthesize what students should understand – not just know.

Students will understand that to be successful an engineer must have business and marketing skills in addition to technical skills.

Student will be able to:

- Perform market survey techniques
- Develop cost analysis and return on investment calculations
- Present marketing plan to decision makers and end users

Essential Questions: Essential questions probe for deeper meaning and understanding while fostering the development of critical thinking and problem-solving skills. Example: Why is life-long learning important in the modern workplace?

- What should be asked in a market survey?
- How do you analyze the results of the survey?
- What is cost analysis?
- How do calculate return on investment?
- How do you create a marketing plan?
- What are the three types of businesses?

Knowledge from this Unit: Factual information.

Skills from this Unit: Performance.

ASSESSMENT(S)

Assessment Method Type: Select one or more of the following. Please consider the type(s) of differentiated instruction you will be using in the classroom.

____ Pre-test
____ Objective assessment - multiple-choice, true- false, etc.
__ Quizzes/Tests
__ Unit test
____ Group project

____
____ Individual project
X Self-assessment - May include practice quizzes, games, simulations, checklists, etc.
____
__ Self-check rubrics
__ Self-check during writing/planning process
__ Journal reflections on concepts, personal experiences and impact on one's life
__ Reflect on evaluations of work from teachers, business partners, and competition judges
__ Academic prompts
__ Practice quizzes/tests
_X_ Subjective assessment/Informal observations
__ Essay tests
__ Observe students working with partners
__ Observe students role playing
____ Peer-assessment
__ Peer editing & commentary of products/projects/presentations using rubrics
__ Peer editing and/or critiquing
____ Dialogue and Discussion
__ Student/teacher conferences
__ Partner and small group discussions
__ Whole group discussions
__ Interaction with/feedback from community members/speakers and business partners
____ Constructed Responses
__ Chart good reading/writing/listening/speaking habits
__ Application of skills to real-life situations/scenarios
____ Post-test

Assessment(s) Title:

Marketing Plan

Assessment(s) Description/Directions:

Students will create a marketing plan with the sections listed below. The students should follow the tutorial to make sure they have fully completed each section *(Note: tutorial can be found below under web resources)*.

1. Purpose and Mission
2. Situational Analysis
3. Marketing Strategy and Objectives
4. Tactical Programs
5. Budgets, Performance Analysis and Implementation
6. Additional Consideration

Attachments for Assessment(s): Please list.

- Why Good Products Fail Worksheet
- Market Survey Guidelines

- Cost Analysis

LEARNING EXPERIENCES

Instructional planning: Include lessons, activities and other learning experiences in this section with a brief description of the activities to ensure student acquisition of the knowledge and skills addressed in the standards. Complete the sequence of instruction for each lesson/task in the unit.

Sequence of Instruction

1. Identify the Standards. Standards should be posted in the classroom for each lesson.

- ENGR-EA-4 – Students will explain the impact of business and marketing on engineering design.
- ENGR-EA-5 – Students will identify the impacts of social, economic, and environmental issues on the engineering design process.
- ENGR-STEM-3 – Students will design technological problem solutions using scientific investigation, analysis and interpretation of data, innovation invention, and fabrication while considering economic, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability constraints.
- ENGR-STEM-6 – Students will enhance reading by developing vocabulary and comprehension skills associated with text materials, problem descriptions, and laboratory activities associated with engineering and technology education.
- CTAE-FS-3 – Communications: Learners use various communication skills in expressing and interpreting information.
- CTAE-FS-5 – Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.
- CTAE-FS-6 – Systems: Learners understand a variety of organizational structures and functions.
- CTAE-FS-8 – Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.
- CTAE-FS-11 – Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.

2. Review Essential Questions.

- What should be asked in a market survey?
- How do you analyze the results of the survey?
- What is cost analysis?
- How do calculate return on investment?
- How do you create a marketing plan?
- What are the three types of businesses?
- What are some important employability skills?

3. Identify and review the unit vocabulary.

4. Assessment Activity.

Day 1

- Ask the class about their knowledge of marketing. Discuss why this is important to engineers.
- Students should read "Why good products fail" by Robert Weisman and answer the questions provided on the Why Good Products Fail Worksheet. As a class, discuss the key points in the article and how this applies to different areas of engineering.
- Introduce the project- - Students will work in teams to hypothetically sell CO_2 cars. They will first develop a marketing survey on CO_2 cars, including what type, color, style, price, etc… as if the car would be produced to sell. Students in other classes (Foundations and/or Concepts) can participate by filling in the surveys. Students will then take the research and design the car. During the design process, the groups should consider the cost of the car, including labor and time, and develop a cost analysis to calculate the return on investment. A marketing plan will be developed to advertise the cars. The cars can actually be created (probably one for each group) or shown using 3D modeling software. The other engineering classes will then vote on the cars, after the marketing is complete, as if they were to hypothetically buy one and gives reasons why they chose a particular car.
- Read and Discuss the Market Survey Guidelines

Day 2

- Students should develop ten questions of their own for the market survey.
- View the "Getting Started" tutorial at SurveyMonkey.com

- The students should then post their survey to SurveyMonkey so other students can access it. *(Note: Make sure the students know the address of the survey; it is vital for other students to be able to take it)*

Day 3

- Students will use the University of Arizona Website on Using Cost Analysis In Evaluation to fill in the Cost Analysis worksheet
- The survey should be given to the other classes to be filled out.

Day 4-7

- Students should review the results from their surveys and use the information to create 3 designs for their car.
- Each group should make a line item budget of equipment, material and labor cost for each car and create a cost analysis, which will be used to help select the final design
- The final design should be created as a 3D model and/or built.
- The groups should determine a price for their model and then calculate the return on investment (Net income divided by Total assets).

Day 8-12

- Students will watch Marketing 101 by Small Business Administration, playing close attention to the marketing plan section.
- Students should follow the steps in this Marketing Tutorial to make their marketing plan.

Day 13-16

- Students should create a sales presentation complete with visual aids and specifics about their car

Day 17-18

- Students will present their plan to the class. The students watching should write 3 positive and 3 improvement comments about each presentation.

Day 19-20

- Cars and marketing materials should be on display for the other engineering classes, who will then vote on the car they like the most. Reveal the voting results to the class.

- Students should discuss the results and compare them to the information collected on the surveys at the beginning. Students should note where improvements could have been made.
- Students should research on the internet the advantages and disadvantages of the three types of businesses (Sole proprietors, Corporations, and Partnerships) and how an engineering firm would operate under each type. Discuss as a class
- Review information covered from this unit.

Attachments for Learning Experiences: Please list.

- CATT Marketing Lesson and Activities
- Cost Analysis
- Engineering Marketing Plan Rubric
- KWL Chart Assessment
- KWL Chart PDF
- Why Good Products Fail Worksheet

Notes & Reflections: May include notes to the teacher, pre-requisite knowledge & skills, suggestions, etc.

CULMINATING PERFORMANCE TASK

Culminating Unit Performance Task Title:

1. Why Good Products Fail
2. Marketing Survey

Culminating Unit Performance Task Description/Directions/Differentiated

1. Assign the article "Why Good Products Fail" (found above under Web Resources) then give out the Why Good Products Fail Worksheet and have students answer questions on the reading.
2. Students will create and analyze a marketing survey from which they will collect information to use in the creation of a product. Guidelines for creating a good survey can be found in the supplemental materials.

Attachments for Culminating Performance Task

1. Grade students on the correctness of their answers.
2. Marketing Survey Rubric:

   A = Questions asked are clear and relevant. Information received from survey is used in product design

   B = Most questions asked are clear and relevant. Some information received from survey is used in product design

   C = Some Questions asked are clear and relevant. Information received from survey is not used in product design

   F = Questions asked are not clear and relevant. Information received from survey is not used in product design

Attachments for Culminating Performance Task

- Why Good Products Fail Worksheet

UNIT RESOURCES

Web Resources:

Day 1:

- NACE Top 5 Employability Skills: http://www.naceweb.org/press/quick.htm#qualities

Day 2:

- Team building skills: http://www.lessonplanspage.com/ScienceSSMars2DevTeamworkSkills56.htm
- Letters of Recommendation: http://ccd.me.edu/careerprep/CareerPrepCurriculum_LP-3.pdf

Day 3-4:

- Resume workshop: http://www.saddleback.edu/ss/ccld/PDF/MicrosoftPowerPoint-ResumeFromStarttoHire.pdf
- Resume writing: http://ccd.me.edu/careerprep/CareerPrepCurriculum_LP-4.pdf
- Resume tutorial: http://www.careerinfonet.org/resume/resume_intro.asp?nodeid=26
- Resume information: http://www.capital.edu/Resources/Files/career-planning/HowToWriteaResume2005.pdf
- High school resumes: http://www.alec.co.uk/resume-examples/high-school-resume-samples.htm

Day 5:

- Cover Letters: http://ccd.me.edu/careerprep/CareerPrepCurriculum_LP-5.pdf

Day 6:

- Interviewing skills: http://ccd.me.edu/careerprep/CareerPrepCurriculum_LP-6.pdf

Attachment(s): Supplemental files not listed in assessment, learning experiences, and performance task.

Materials & Equipment:

What 21st Century Technology was used in this unit:

	Slide Show Software		Graphing Software		Audio File(s)
	Interactive Whiteboard		Calculator		Graphic Organizer
	Student Response System	X	Desktop Publishing		Image File(s)
	Web Design Software		Blog		Video
	Animation Software		Wiki		Electronic Game or Puzzle Maker
	Email		Website		