

# CARDINAL TECHNOLOGY

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## DESIGN BRIEF: GUMBALL DISPENSER

Start Date: 8/30/2016: Design and build a working gumball/jelly bean dispenser. The dispenser should be designed to release 2 gumballs or jelly beans at a time.

### PROJECT OBJECTIVES

- Advanced practice of 3D Modeling concepts and procedures. Practice creating Engineering Drawings.
- Develop an understanding of “manufacturing” challenges.
  - Working to deadlines
  - Networking
- Apply Creative Problem-Solving Methodology to reach a unique solution to given project criteria and parameters.

### PROJECT PROCESS/PROCEDURES

1. All students are required to read and abide by the rules and regulations found in this document. **PLEASE NOTE: IT IS YOUR RESPONSIBILITY TO READ AND UNDERSTAND THE RULES.** If you have questions, you may consult your teacher.
2. The Design must meet the following criteria:
  - a. The device can be no larger than 7” tall x 5” X5”.
  - b. The Dispenser mechanism must be 3D printed.
  - c. At least one side must be clear to show the operation of the dispenser mechanism.
  - d. No glass may be used.
  - e. The device must be of the student’s own design.
  - f. The device must be easily refillable with some type of door to prevent spillage.
  - g. The device should be clean and neatly constructed. It should also be constructed in such a way as to be attractive on display.
  - h. Instructions on how to operate the device must be included somewhere on the device. They should be clearly visible and easy to read.
3. A Website must meet the following criteria:
  - a. Be set up on Weebly.com
  - b. The Design Challenge clearly stated
  - c. The school year and Jonesboro High School Engineering and Technology visible.
  - d. A Page with information about the Design Process. (Each step explained.)
  - e. A Page with ALL the Brainstorming ideas displayed.
  - f. Pictures of ALL Mock ups and Prototypes
  - g. A Page with the Chosen solution sketched into orthographic drawings with dimensions.

- h. A page with the Engineering drawings down in Inventor.
  - i. A page with an Assembly Drawing.
  - j. A page with a Gantt chart outlining projected and actual time lines for completion.
  - k. A Blog with at least two entries each week that outline what has been done during the week:
    - i. Pictures of progress
    - ii. Written entries of goals for the week, met goals, problems encountered.
4. Packaging a box must be designed to protect the dispenser and advertise it.
- a. Box must have a logo
  - b. Box must be made by team.
  - c. Box must be printed on cardstock
  - d. Box must have description of device.
  - e. Box must have instruction for use.
  - f. Box must have a picture of the device
  - g. Box must be attractive and neatly done.
5. Team Organization
- a. Who are the team leaders?
  - b. How will you manage the work?
  - c. What responsibilities will be assigned to each member?
  - d. How often will you meet for a team meeting to discuss progress?
  - e. How will you address difficulties with team members?
6. .
7. Students will prototype, test, evaluate, and refine/revise their design in order to reach an optimal solution to the state problem. Application of the iterative process of Design and Engineering.

## **LENGTH OF INSTRUCTION PERIOD**

5-Weeks Application of Design Process: Gumball Dispenser

## **TOOLS/EQUIPMENT/PARTS/MATERIALS**

- Design Journal
- Pencils
- Measuring Devices
- Computers w/ AutoDesk Inventor Parametric Modeling Software
- 3D Printer

## DELIVERABLES AND ASSESSMENTS

- Webpage
- Package for Dispenser to be sold in.
- Prototype of the designed Gumball Dispenser

<b>Gantt Chart</b>				
Monday	Tuesday	Wednesday	Thursday	Friday
Sept 12 Start of Project Pretest Make a Design Journal, Table of Contents/Number Pages	13 Research Ideas and begin drawing Concept Drawings	14 Concept Drawings	15 Concept Drawings	16 /Begin working on Multiview sketches of selected Concept Drawings
19 Design Journal Check: • 9-10 Concept Drawings Mock-ups Quiz	20	21	22	23 Design Journal Check: • Multi-View Drawings • Website Grade
26	27	28	29	30 Design Journal Check: • Engineering Drawings of all Parts • Website Grade
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">           NOTE: 3D printing can begin as soon as you have met the requirements.         </div>				
Oct 3	4	5	6	7
10	11	12	13 Project 1 <sup>st</sup> Due Date	14
17	18 •	19	20	21
24	25	26	27	28 Extended: Project Due
This color means Pate was out.	This color means there was no school.			

<b>Grading</b>				
	100pts	70pts	50pts	0pts
<b>Website</b>				
a. Set up on Weebly.com	Done			
b. The Design Challenge	Clearly stated	Poorly Stated		Missing
c. The School year and Jonesboro High School Engineering and Technology	Visible			Missing
d. Design Process Page.	Each step explained clearly with a graphic	Steps mostly explained and/or no graphic	Steps only listed	Missing
e. Brainstorming Ideas Page	ALL the Brainstorming ideas Page displayed. (28 total)	Less than 28- but more than 20 Displayed	19 or less displayed	Missing
f. Pictures of ALL Mock ups Page	28 mock ups	Less than 28- but more than 20 Displayed	19 or less displayed	Missing
g. Orthographic Sketches of Best Solutions Page	Pictures of the two Best Solutions Orthographic Sketches with Dimensions	Pictures of one the Best Solutions Orthographic Sketches with Dimensions	Pictures without dimensions	Missing
h. Engineering Drawings Page (Inventor) with dimensions	Drawings of both Designs with dimensions and title blocks completed	Drawing of one Design with dimensions and title blocks completed	Drawing(s) with no dimensions	Missing
i. Gantt Chart Page	Dates and when things were projected to be completed and actually done.	Most of the Dates and when things were projected to be completed and actually done.	Calendar and some information	Missing
j. Blog Page	Two or more entries each week that outline what was done during the	Few entries each that outline what was done	Most entries failed to meet criteria	Missing

	week: -Pictures of progress -Written entries of goals for the week, met goals, problems encountered.	during the week and/or not many -Pictures of progress -Written entries of goals for the week, met goals, problems encountered.		
• Concept Drawings	2 per member in group	Did two less than the number of two per member in group and/or not well developed	Did less than 3 of the total required.	
<b>Packaging Box</b>				
a. Logo	Logo is Designed by student, Well Crafted	Logo is Designed by student, Poorly Crafted	Logo is a Cut and Paste	Missing
b. Box	Made by team Shows quality craftsmanship	Made by team Shows an attempt at quality craftsmanship	Use of premade box and/or very poorly crafted	Missing
c. Box must have description of device.	Description Present and Neat	Description Present but not neat		Missing
d. Box must have instruction for use.	Instructions clearly stated and visible	Instructions stated and/or somewhat visible		Missing
e. Box must have a picture of the device	Picture neatly displayed	Picture there but not neat		Missing
<b>Prototype</b>				
Prototype	Neat Works	Neat Does not Work	Poorly built and /or does not work	Missing
Soft Skills	Weekly Grade			

## **STATE DOE STANDARDS**

### **STEM-EC-5**

#### **Explain a whole systems approach to the engineering design process to solve a technical problem.**

- 5.1 Describe the role of problem identification and definition, brainstorming, research, specifications, constraints, criteria, alternative solutions, analysis, decision making, communication, evaluation, and modification as activities comprising the engineering design process.
- 5.2 Apply the engineering design process to the solution of a technical problem.
- 5.3 Optimize and justify design solutions based on cost, time, schedule, and performance constraints.
- 5.4 Communicate design solutions to peers and potential consumers using graphical media, oral presentations, and technical writing.
- 5.5 Evaluate the design based on consumer research, peer feedback, financial and safety risk, and cost benefit analysis to optimize the design solution.
- 5.6 Demonstrate an understanding of the continuous improvement process as it applies to new designs and modifications of existing designs for new applications.

### **STEM-EC-6**

#### **Employ critical thinking skills and teamwork skills when working in groups to solve problems, to make decisions, achieve group goals and use team members' talents effectively.**

- 6.1 Identify and describe common tasks that require employees to use problem-solving skills.
- 6.2 Analyze elements of a problem to develop creative solutions.
- 6.3 Describe the value of using problem-solving and critical thinking skills to improve a situation or process.
- 6.4 Create ideas, proposals, and solutions to problems.
- 6.5 Work with others to achieve objectives in a timely manner.
- 6.6 Promote the full involvement and use of team members' individual talents and skills.
- 6.7 Demonstrate teamwork processes that provide team building, consensus, continuous improvement, respect for the opinions of others, cooperation, adaptability, and conflict resolution.
- 6.8 Take responsibility for shared group and individual work tasks.
- 6.9 Demonstrate sensitivity to and value for diversity.
- 6.10 Apply peer evaluation techniques to critique group members.
- 6.11 Integrate business principles when working as a team.

### **STEM-EC-7**

#### **Summarize and apply engineering solutions through the audience appropriate application of engineering graphics and technical writing.**

- 7.1 Communicate design specifications through Engineering drawings and multiple media
- 7.2 Apply tools to mathematically analyze engineering design problems.
- 7.3 Apply accurate dimensions to a technical drawing, including size and geometric tolerances.
- 7.4 Prepare a persuasive proposal for an engineering solution.
- 7.5 Document engineering design processes using an engineering design notebook.
- 7.6 Prepare a report of engineering design activities including a description of analysis, optimization, and selection of a final solution.
- 7.7 Research and benchmark a technological problem or idea.
- 7.8 Use oral and visual communication skills to deliver an engineering design presentation.

### **STEM-EC-8**

#### **Apply basic engineering tools and resources to aid in data collection and problem solution sets.**

- 8.1 Demonstrate understanding and application of various measurement systems.
- 8.2 Demonstrate understanding and application of various base units in both English and international systems.
- 8.3 Demonstrate an understanding of the importance of tool calibration and precision measurement instruments.
- 8.4 Demonstrate the use of precision measuring instruments to measure and inspect parts to optimize the solution to a problem.
- 8.5 Use appropriate technologies or applications to generate data to optimize solutions to a problem.
- 8.6 Graphically display the collection of data.
- 8.7 Use laboratory tools, equipment, and technologies to demonstrate the properties of materials.

**STEM-EC-9****Cite evidence for the role of troubleshooting, research and development, inventions, and innovations in problem solving.**

9.1 Demonstrate an understanding of the difference between an invention and an innovation and the importance in developing solutions.

9.2 Use appropriate evaluation tools while troubleshooting during the design process.

9.3 Examine business and industry research to prepare devices and systems for the marketplace.

9.4 Use an interdisciplinary approach to problem solve.

**CTAE Foundation Course Standards / Common Core GPS / Georgia Performance Standards**

**ELACC9-10SL1:** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

**ELACC9-10SL2:** Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

**ELACC9-10SL3:** Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

**ELACC9-10SL4:** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.