**Website Development-Brief**

**Objective**
Students will design a google website to be used as a digital portfolio.
Learn to use google site and communicate development of the engineering design process through the project postings on the site.

**Assignment**
Students will open a google site account, select a template or create their own design. Website design is up to the student.
The site will present one tab or link for each challenge done in class.

Each completed project must have a reflection that describes how the project achieves the goal presented to the team, effectively critiques of the work, and provides suggestions for improvements. As well as any required materials, pictures, postings, etc required by the teachers.
The site must show:

Student name
Class
Company name and Logo
One section per assignment given with all the required information.
Student determines color and page arrangement

The site must follow Electronic Portfolio Rubric

**Website Design, aka. e-Portfolio Requirements**

The idea of the website creation is multifaceted. First it is a design concept unique to your company (Ie. Your Group). By the way it looks it should convey to the viewer the type of company that you are. Does it inspire?, shows care and detailed? Is it edgy or mainstream? Does it show it is about biological design and engineering? Second this counts as 25% of your final grade. Lastly, this is a great demonstration of what you can do. It can be a great asset for college and future jobs. You can showcase your work to prospective employers/recruiters!

Even though you will be working in teams, each student is required to produce a website. Yes, some things will be the same. I expect the explanations to be unique to each individual. Each of us speaks, writes, thinks a different way. I want to see your ideas, thoughts, and presentation.

Your web page must have

1.An original logo design
Must be created in Inventor
Finishing touches may be done in any Photo editing program- Paint, Gimp, Doodle, Photoshop, etc.

2.A mission statement
What is the purpose of your company?
What drives you or your company to succeed?

3.For each challenge there should be

3.1.A step by step explanation of the engineering design process.

3.2.Include labelled: Pictures, .pdf, CAD designs, etc

3.3.Explanation of concepts, constraints of the project and challenges you

encountered.
3.4. A separate page/link for each project “outside” of the homepage.

4. It is up to you what the site will look like but it should be appropriate for school and pleasing to the eye.
Think of colors that are fun, but easy to read.
What kind of layout will make your webpage stand out from everyone else’s?

# Creating a web site on google sites

1. Go to google sites ->
2. Click on “Create”
3. Select Blank Template
    a. Type in name of site
    b. Select a Theme
    c. Click on “Create” at the top of the page
4. After clicking Create, your new webpage will appear with just the blank homepage
5. Here are the different options to “Edit” your page:

1. **Edit** Page (Make sure you hit save when you’re done with this function!)
    a. Here you will find many basic functions
    b. Insert: to place images, text, Google gadgets, links, text box
    c. Basic text editing
    d. Format: different heading, subscripts
    e. Table: Insert tables

f. Layout: create different layouts for your text and images for your site

2. **New Page:**
    a. Create a new page within your website I'll get to this later, will make another JPEG layout for this
3. **More:**
    a. Manage your site
    b. Change parts of your theme
    c. Share your page

## General Website Design Rubric

| | | |
|---|---|---|
| Original logo design | Must be created in Inventor (5pt) | |
| | Sketches present (.jpeg, .pdf, etc) (3pt) | |
| | Finishing touches may be done in any Photo editing program- Paint, Gimp, Doodle, Photoshop, etc. (3pt) | |
| | Logo is found in predominant place in the home page (2pt) | |
| Mission statement | What is the purpose of your company?Well written and clear purpose. Edited. (2pt) | |
| Challenge Page | A step by step explanation of the engineering design process. (8pt) | |
| | Include labelled: Pictures, .pdf, CAD designs, etc (2pt) | |
| | Explanation of concepts, constraints of the project and challenges (2pt) | |
| | A separate page/link for each project "outside" of the homepage. (4pt) | |
| Appropriate for school and pleasing to the eye. | Think of colors that are fun, but easy to read. What kind of layout will make your webpage stand out from everyone else's? (4pt) | |
| | Total | _____/35 |
| | % | |

**Portfolio and reflection reminders**

1. Use your handouts for each of the following projects:

**Phalanges**
**Game Board**
**Final- Biomimicry design**

*2. As a reminder please include for each project:*

Engineering Design Process

Reflection- Explain how the design evolved from concept/sketch to the final design. Include critique (if any from your classmates or partner) and how would you change/modify the design based on test/evaluation/critique.

Remember that all pictures/diagrams should have a caption and citation.  There should be multiple pictures from different phases of the Engineering Design Process that give the reader a good sense of what you have design and details of importance.  They should paint a picture of the progression in the particular challenge.

Make sure the page navigation flows and grammar is appropriate.

For the designs that we could not print or build, explain the idea or concept that you envisioned *and* the potential constraints and drawbacks. Also, explain *why* your design is the appropriate solution for the challenge in detail.

# Bionic Humans: Robotic Human Arm Lesson Plan

## Objectives

Students will gain understanding

✓ In the anatomy of the bone with emphasis on the arm

✓ On the function of joints

✓ How muscles help with the arm movement

✓ How to use the anatomy and physiology to build a prototype robotic arm that can pick up a cup

✓on the application of the engineering design process

## State Standard Addressed

## Materials Required

1. Textbook: Essentials of Human Anatomy and Physiology, 10th edition by Elaine Marieb
2.Computers with internet connection
3.For the engineering challenge: PVC pipes, string, fabric, cups

## Lesson Overview

*Background*

*Student will learn basic information on the anatomy and physiology of the skeletal system focused on the arm. The basic information covered will be an overview of the function and classification of the bones basic structure, gross anatomy and microscopic anatomy. Focus on basic understanding of the bones of the upper limb and joints. Using this knowledge students will be able to better understand how the arm works and use/apply that knowledge to design, build and test a prototype robotic arm that can pick up a cup. As an extension we will talk about the need of prosthetic limbs influenced by war and the new materials and technologies utilized in this area of great interest to our veterans, in particular.*

## During this lesson

✓ Student will be introduced to the need and recent inventions on prosthetic arms. They will be shown and asked to discuss the 60 minutes show, Creating a Bionic Arm. (**http://www.cbsnews.com/video/watch/?id=4937716n%3fsource=search_video**)
This show will serve as a jump start discussion on the needs of prosthetic limbs and ideas for their engineering project.

✓ Students will be introduced to the anatomy and physiology of the arm. *Topics covered in order will be:*

*Skeleton*

a. General Bone Overview: Function, Classification and Structure
b. Axial vs Appendicular Skeleton
c. General introduction to bones of the upper limb, ie. The Arm, Forearm, and Hand
d. Types of Joints and articulations
e. Muscle movement and attachment

*Muscles*

a. Function and types
b. Types of movement
c. Muscle attachment (origin and insertion)

✓Chicken leg dissection. Role of tendons.

✓Introduction to the engineering challenge: Build a robotic arm that will pick up a cup. Show NASA robotic engineer video explaining how he designs and builds humanoid robots that can work alongside astronauts. http://pbskids.org/designsquad/parentseducators/guides/mission_sandeep_yayathi.html

✓Follow the engineering design process to build. As a class determine the constrains for this project.

✓Discuss 21 Century Skills we are developing in with this project

✓Discussion of how the idea develop over the course of brainstorm, building, prototype and testing. Lessons learned and how to improve this challenge.

✓Student will write a detailed reflection on the robotic arm building process. Then as a class they will sit for a round table explaining the engineering design process they went through. Each team will contribute from their unique perspective. This will be videotaped and included in their company website.

✓ Students will write a detailed reflection on the engineering design process as it relates to their robotic arm design.

✓Discuss the bioethics implications of bionics.

## Differentiated Instruction

- ✓ The use of a range of multimedia and hands on laboratories benefits all students and allows each student or group of students to work at their own pace
- ✓ Teacher direct instruction and ability to answer questions during group work benefits those who may not have understood the textbook or power point
- ✓ Deadline extension, if necessary

## Assessment and Follow Up

✓ Students will be assess on their use and description of use of the Engineering Design Process. This will be done on their previously created web site.
✓Unique and innovative use of the materials provided and compliance of the challenge requirements
✓Effective group work and time management
✓Test and revision/reengineering of their robotic arm

# Robotic Arm: Analysis of the Engineering Design Process Video Questions

We will do a class video recording of what you learned while designing, constructing and testing your robotic arm. The following are questions you need to discuss with your "business partner" and be able to speak fluidly when we start recording.

**About brainstorming:**

- What were some of your initial ideas/designs?
- How/why did you choose one from all of your options?

**About Design & Construction**

- How did the original idea changed/morphed into what you presented as the final product?
    - ✓What constraints were present?
    - ✓How did the materials you had to work with changed the design?

**Testing**

- Describe what happened when you did the official testing?
- Explain what you did to re-design and the results.

**Final Analysis**

- What do you have to say about team work & communication?
- What would you recommend to the next year class about this project?

Anatomy of an Arm by Sam Butler



# Anatomy of the chicken wing vs. Human arm

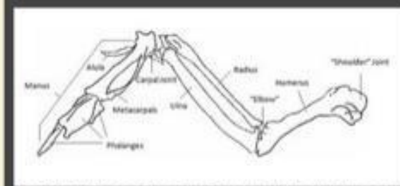


Image 1- These the wing bones of a chicken wing


Image 2- Note: The wrist of the human hand is made up by the carpals, after the wrist, the metacarpals make up the palm, and the phalanges make up the fingers.

Human arm bones and the wing of a chicken are very similar. Although there are major differences, the basic structure remains largely the same.

First, both the arm and the wing attach at a shoulder joint.

Second, both of the appendages start with a humerus, a large single bone that inhabits the upper arm. The humerus on both the wing and the arm are attached to the radius and ulna at the elbow joint.

Third, the second part of the arm/wing has the same bones. The Ulna and the Radius are in the same place and are connected to the same parts in both species.

Fourth, in both the wing and the arm, the radius and ulna bones attach to the carpels at the carpel joint (wrist).

Lastly, the arm and wing both end in a hand or a hand like structure (metacarpals/phalanges). The carpels attach to the metacarpals and the metacarpals extend to the phalanges.

There are some differences between the two. First, the metacarpals of the chicken have only one or two bones in them, while the human hand has 5. Second, the phalanges of the chicken have 3 bones, while the human hand has 18. Third, the overall direction and the range of movement of the wing is made for flight, while the human arm is meant for moving things. Lastly, the wing of the chicken is delicious, while the human arm probably does not very taste good.

This experiment was very helpful in understanding the structure and function of the human arm.

Image one- taken from http://samhokamp.wikispaces.com/Lab+9+Comp.+Vert.+Anat, via Google images. Artist unknown.

Image 2- taken from http://www.kidport.com/reflib/science/humanbody/skeletalsystem/arm.htm, via google images.

Coughlin_Bioengineering

Search this site

Home | Biomimicry | Board Game For A Blind Child | Chicken Wing Dissection | Glasses Design | Index Finger Design | Logo Design | Plant Watering Device Design | Robotic Arm Design

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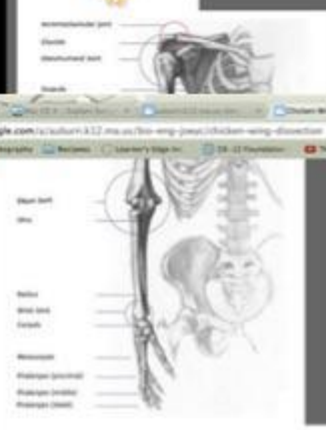
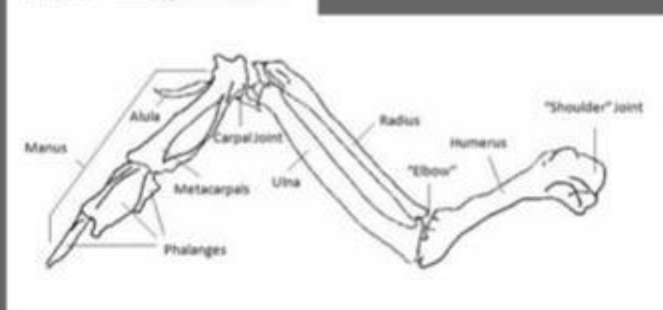
- **Chicken Wing Dissection**
- Glasses Design
- Index Finger Design
- Logo Design
- Plant Watering Device Design
- Robotic Arm Design
- Sitemap

# Chicken Wing Dissection




**Top:** Two labeled diagrams of a human arm and its parts.
**Bottom:** A labeled diagram of a dissected chicken wing.

**Citations:** Google Images, Google, "Human Arm VS Chicken Wing" Worksheet

**Similarities:**
1. Both the chicken wing and the human arm have phalanges. The chicken's phalanges are used to spread the wings and allow them to propel themselves up to fly or attempt to fly. The human uses its phalanges to grasp objects that are needed to the human.
2. Also, both the chicken and the human have metacarpals. The metacarpals are used to connect the phalanges to the carpals or carpal joint. The metacarpals can also bend and move if needed by the human or chicken to help it.
3. The wrist joint in the human is the equivalent of the carpal joint in a chicken.The wrist joint and the carpal joint allow more movement in the area that it is located in.
4. The Ulna and the Radius are also two bones that are the same. They provide a link from the wrist to the elbow.
5. Both creatures have an elbow which is used t bend in the middle area of the arm.
6.The humerus is in both the chicken and the human bone structure. It links the elbow and the shoulder.
7.Last the shoulder joint is what connects the entire bone structure to the rest of the body.

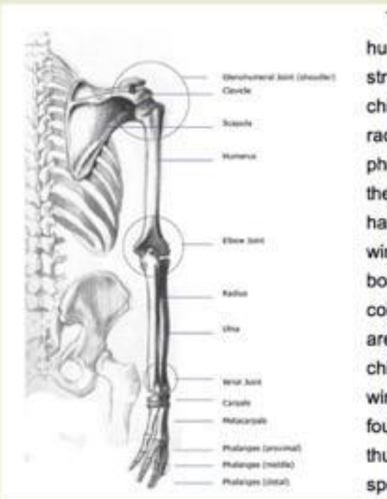
**Differences:**
1. The manus is a part on the chicken wing that is not on the human arm.
2. The alula is a part of the chicken wing that is not in the

The chicken wing is extremely similar to the human arm in many ways.The chicken wing and the human obviously have a common ancestor due to the fact of how similar they are. The human arm evolved over time to be able to move things, grasp things, and pick up and put things down. The chicken wing evolved to be able to flap and propel the chicken above the ground and to be able to bend to fit at the chickens side. Overall the chickens joints, bone placement, and the bone structures are almost identical, but not exactly. There are very few differences between a chicken wing structure and a human arm structure.

## Comments

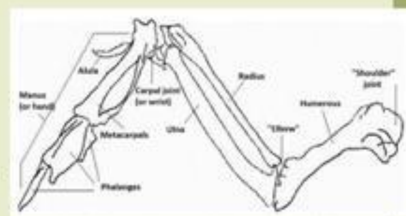
You do not have permission to add comments.

# Chicken Wing Expedition



http://healthpages.org/images/bones-of-the-arm-labeled-back.jpg

The wing of a chicken and the arm of a human are very similar. They are similar in structure, bones, and movement. A chicken's wing consists of a humerus, radius, ulna, carpals, metacarpals, and phalanges just like a human arm does. Also, they both have a elbow joint and a wrist or hand joint. Each bone in both the chicken wing and the human arm are the same. The bones done just have the same names coincidentally. The phalanges of a human are the fingers and the phalanges of a chicken are also the fingers. But a chicken wing only has one finger as a human has four and the ever so important imposable thumb. The radius and ulna are in the same spot in both organisms and do the same job. They are there to connect the wrist joint and the elbow joint together. Even though the chicken wing has more bones than the human are they are still closely similar to one another.



http://brendanmccarron.wikispaces.com/file/view/new_chicken_wing.jpg/216060084/560x280/new_chicken_wing.jpg

### Comments

You do not have permission to add comments.

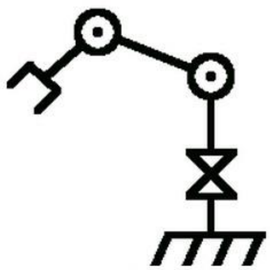
# Robotic Arm Challenge

## Constraints:

Free standing
Must pick up the cup from 45cm away
Must lift cup to a height of 15cm
Cup must be half full of water

## Materials:

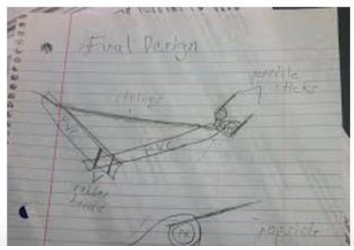
PVC Piping
String
Popsicle Sticks
Zip Ties
Rubber Bands
Hot Glue
Fabric



Basic robot arm concept schematic
source: Society of Robots

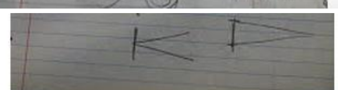
## Engineering Design Process:

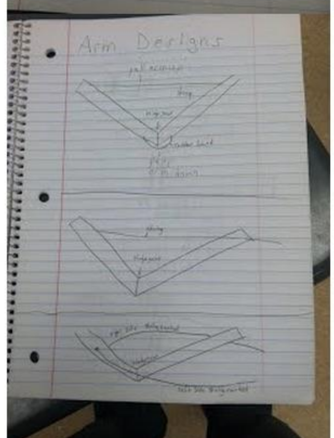
1. Problem or Need: We needed to be able to pick up a cup from a distance of 45cm and lift it to a height of 15cm. the arm also had to fit into a clamped piece of pipe in order for it to be free standing.
2. Research: Our research included dissecting a chicken wing in order to learn about how joints, muscles, and tendons.
3. Develop Possible Solutions: possible solutions we came up with included hands with two moving pieces as well as designs with a thumb-like appendage and one moving piece.

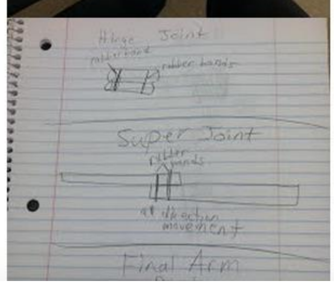


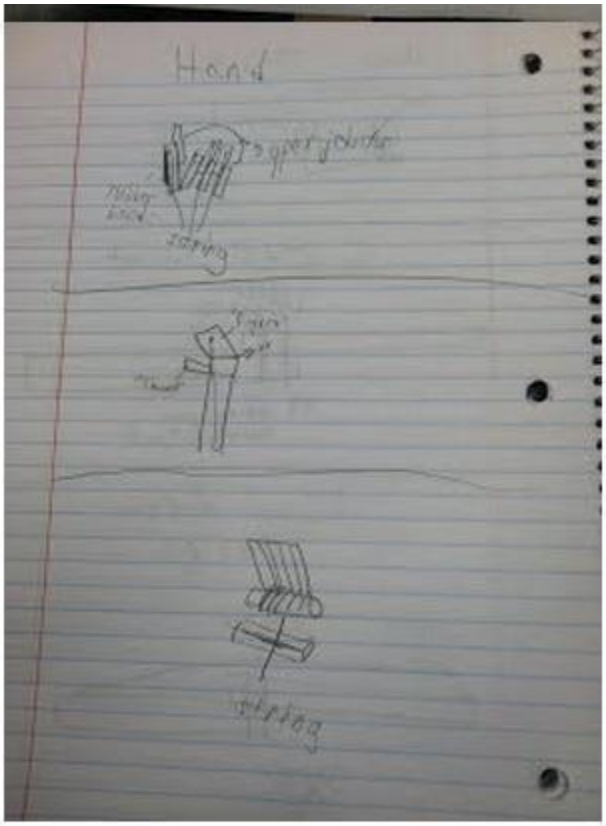

## Reflection:

Looking back on the success of our project I think that as a company we produced a very functional and user friendly arm. The process of designing and building the arm had very few obstacles that stood in our way for more than a moment. The most challenging part of the project was the materials that we had to work with, being limited on resources forced us to adapt to what we had to work with. The best part of the challenge was when we got to the point at which the arm was coming together and became operational because it started to have the capacity to not only lift a cup, but lift the cup with water in it. In conclusion I think the robotic arm challenge was a fairly challenging and fun activity.







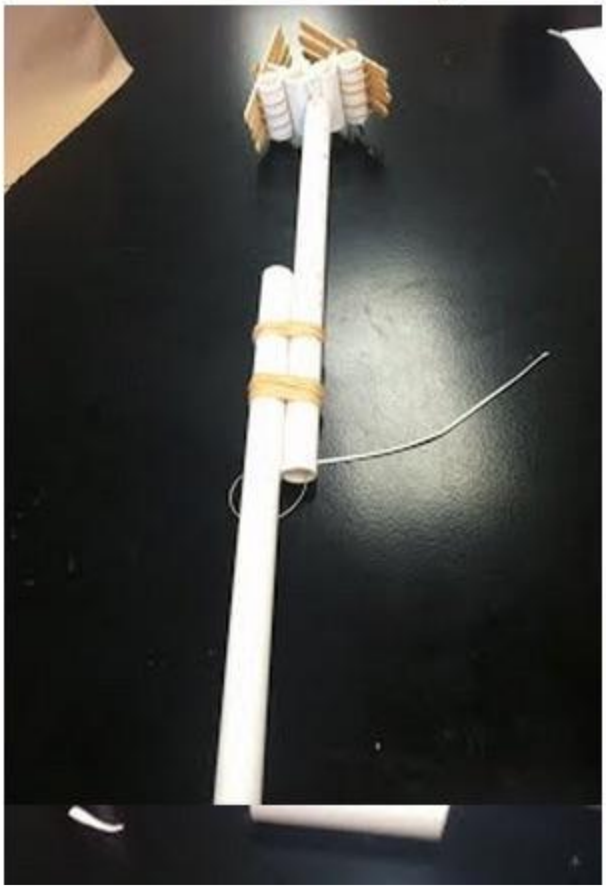

Primary design sketches

4. Select Best Solution: We selected our hand design by first testing both the design with the two moving pieces then when that design failed we switched to a design with only one moving piece and instead had a more thumb-like appendage. once we tested the thumb design , the superior grip and performance made it the better option.

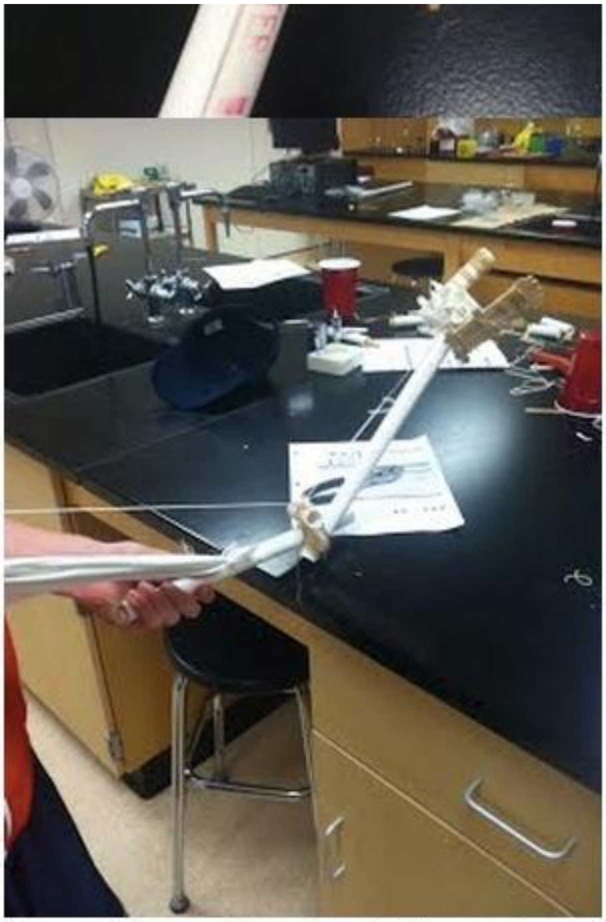
5. Prototype: We were continuously modifying parts of our arm as we went making it a working prototype throughout the entire challenge.

6. Test and Evaluate: We continuously tested throughout the challenge and changed our designs according to what worked best.

7. Communicate: We communicated possible upgrade an improvements throughout the entire project as well as after the initial testing of the arm.



8. Redesign: We redesigned the hand and elbow joint for better strength and grip in order to more effectively pick up the cup


The redesigned hand and elbow joint

Introduction to Water Treatment

Watch this introductory video:
https://www.youtube.com/watch?v=ylLRbs42_wk

Research and answer the following questions:

1.) How is water related to the greatest number of deaths worldwide?

2.) Explain obstacles (at least 3) populations in developing countries face when obtaining fresh, clean, drinkable water.

3.) List and describe some health effects of drinking polluted or unsanitized water.

4.) If roughly 2 billion of the world's population does not have "adequate" sanitation facilities for their water, approx. what % of the total world population is this?

5.) What types of contaminants are populations in developing countries exposed to? Describe one inorganic and one organic contaminant.

Helpful links:

http://www.unicef.org/wash/index_43106.html

http://worldsavvy.org/monitor/index.php?option=com_content&id=709&Itemid=1195

http://www.waterencyclopedia.com/Da-En/Developing-Countries-Issues-in.html

**CP Environmental Engineering\Water Treatment Device Rubric**

**REQUIREMENTS FOR DIGITAL PORTFOLIO**

| | Evident (3) | Partially Evident (2) | Not Evident (1) |
|---|---|---|---|
| Picture of Apparatus | | | |
| Professional Drawing of Apparatus | | | |
| Research about problems faced in Botswana including demographic information | | | |
| Qualitative Data Table | | | |
| Quantitative Data Table | | | |
| Explanation of data collected (why is it important? what does it mean?) | | | |
| Explanation of why you chose this design (give 2 alternatives or additions) | | | |
| Peer review: 2 well thought out suggestions by other groups | | | |
| Overall Classwork Effort | | | |
| Materials List | | | |
| Estimate Cost to manufacture | | | |
| Group presenation (summarizes all of the above) | | | |

# Wind Turbine Prototype Rubric

Wind Turbine

| | Evident- 2 | Partially Evident-1 | Not Evident- 0 |
|---|---|---|---|
| blade fabrication | | | |
| secure generator | | | |
| turbine fabrication | | | |
| power generation | | | |

Tower

| | Evident-2 | Partially Evident | Not Evident-0 |
|---|---|---|---|
| Tower Design | | | |
| Tower Fabrication | | | |

OVERALL PERFORMANCE

| | Excellent-4 | Good- 3 | Fair- 2 | Poor- 1 |
|---|---|---|---|---|
| Final Construction and Wind Test | | | | |

12-14= A 9-11= B 6-8= C 4-5= D below 3= F

**ENVIRONMENTAL ENGINEERING DIGITAL PORTFOLIO REQUIREMENTS**
**TRIMESTER 2, 2012-2013**

**FILM CANISTER ROCKET CHALLENGE**

| | EVIDENT- 2 | PARTIALLY EVIDENT- 1 | NOT EVIDENT-0 |
|---|---|---|---|
| Initial Test Results (how much water/tablet- why?) | | | |
| Rocket Design- picture or drawing | | | |
| Analysis questions answered completely | | | |

**ELECTRICITY LAB- WORKING WITH A MULTIMETER**

| | EVIDENT-2 | PARTIALLY EVIDENT- 1 | NOT EVIDENT-0 |
|---|---|---|---|
| Key Terms/notes from class lecture | | | |
| Data Table with testing results | | | |
| HW- how many amp service is your house? | | | |
| HW-Sketch or upload a picture of your fuse box or circuit breaker panel from your house | | | |

**INSULATION STUDY (12/14 AND 12/17)**

| | EVIDENT-2 | PARTIALLY EVIDENT-1 | NOT EVIDENT-0 |
|---|---|---|---|
| Graph of Cooling Rate Experiments | | | |
| At least 2 tests per material | | | |
| At least 3 materials tested | | | |
| Discussion of R factor- what is it? How is it used? | | | |
| Research notes about insulation/"green" insulation types in homes | | | |

**PASSIVE SOLAR HEATING (12/18-12/19/12)**

| | EVIDENT -2 | PARTIALLY EVIDENT- 1 | NOT EVIDENT-0 |
|---|---|---|---|
| Picture/diagram of model solar house | | | |
| Cooling Rate of House | | | |
| Research Notes about renewable energy, direct, indirect, passive, and active solar heating | | | |
| Experiment using researchable question about passive solar heating | | | |

One Auburn Square
Auburn, MA 01501

Sept. 16, 2014

Dear Colleague,

We are excited to have you on our team here at Drinkingwatercounts.org.  As you know, we consider water a commodity in the U.S, but many countries do not have daily access to fresh, clean drinking water.  As our company grows, we are looking to add as many drinking water options to our services as possible. You will be assigned to the Botswana Division. Your first assignment is as follows:

Design a portable/disposable water purification device for rural villages in Botswana. We will be looking forward to a presentation on Sept. 25th which shall include the following information:

1.) Qualitative Data
2.) Quantitative Data
3.) Professional Drawing of device
4.) Materials List
5.) Estimate cost to manufacture

We look forward to working with you! Welcome to the Team!

Most Sincerely,
Karen Ares and Chris Lajoie
Vice Presidents of Research & Development
African Divisio

Drinkingwatercounts.org
Device Engineering Division
One Auburn Square
Auburn, MA 01501

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