Audio problems? Click the “communicate” button at the top of your screen. Then click “test audio.”
• For multiple age groups
• Inexpensive!
• Flexible for use in different types of programs
• Correlate to national education standards
Playful Building

Activity 1: Design a Park

Activity 2: Team Machine
Activity 3: Water Wedges
Activity 4: Levers at Play

Activity 5: Low-tech Water Filter for High-impact Clean
Activity 6: Wind Turbine Tech Challenge

For families or groups of children
Ages 5-13

Social!

Additional activities listed as extensions
Plan

Activity 1: *Design a Park*

Play

Activity 2: *Team Machine*
Activity 3: *Water Wedges*
Activity 4: *Levers at Play*

*Playful Building Implementation Guide*

Power and Protect

Activity 5: *Low-tech Water Filter for High-impact Clean*
Activity 6: *Wind Turbine Tech Challenge*
Plan

Activity 1: Design a Park

Activity 2: Team Machine
Activity 3: Water Wedges
Activity 4: Levers at Play

Play

Activity 5: Low-tech Water Filter for High-impact Clean
Activity 6: Wind Turbine Tech Challenge
Be Creative...Be an Engineer!
Implementation Options

Stations

• One or more longer events
• Patrons sample multiple activities
• Example: Offer activities 2-4 as a “Playground of Machines”
• Train teens or undergraduate engineering students to facilitate stations
Implementation Options

Individual Events

• Facilitator-led
• Offer each activity as a separate event
• Patrons may fully explore the engineering design process
Activity 1: DESIGN A PARK
Plan the Park of Your Dreams!

**THINK**

Place different park features on the grid to create a map of your park!

- 10 or fewer park features OR keep your total under 250 points
- Everything must fit on the grid!
- Your park must include restrooms.
- Use yarn to represent trails or bike paths. Give visitors a way to get to each of your park’s features.
- Add yellow beads along the paths — these represent lights.

**Draw**

**Talk**

**Explore**

**Write**
Plan the Park of Your Dreams!

What would you choose for the park of your dreams?
## Costs

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pond</td>
<td>10</td>
</tr>
<tr>
<td>Ball Courts (such as for basketball or tennis)</td>
<td>15</td>
</tr>
<tr>
<td>Dog Park</td>
<td>15</td>
</tr>
<tr>
<td>Water Playground</td>
<td>20</td>
</tr>
<tr>
<td>Swimming Pool</td>
<td>30</td>
</tr>
<tr>
<td>Stream and Footbridge</td>
<td>30</td>
</tr>
<tr>
<td>Trail/bike paths</td>
<td>30</td>
</tr>
<tr>
<td>Community Garden</td>
<td>50</td>
</tr>
<tr>
<td>Picnic Area</td>
<td>75</td>
</tr>
<tr>
<td>Restrooms and drinking fountains</td>
<td>90</td>
</tr>
<tr>
<td>Playground</td>
<td>150</td>
</tr>
<tr>
<td>Skate Park</td>
<td>215</td>
</tr>
<tr>
<td>Baseball Diamond</td>
<td>250</td>
</tr>
<tr>
<td>Parking Lot</td>
<td>200</td>
</tr>
</tbody>
</table>

## Savings

<table>
<thead>
<tr>
<th>Item</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind Turbine Generating Electricity</td>
<td>-1</td>
</tr>
<tr>
<td>Boat Rental Shop, Boat Slip, and Pond</td>
<td>-30</td>
</tr>
<tr>
<td>Wetland</td>
<td>-30</td>
</tr>
<tr>
<td>Open space</td>
<td>-85</td>
</tr>
<tr>
<td>Ice Cream Shop</td>
<td>-300</td>
</tr>
</tbody>
</table>
Activity 2: TEAM MACHINE
Establish a pattern

1. Form a circle.
2. Say your name.
3. Toss the beanbag to someone across from you (not next to you). Remember that person’s name.
4. Keep going until each person has caught the beanbag.

Keep the same order as you try to go even faster!
The faster, the better!

**THINK**

How can you decrease your time?

**BUILD, TEST, and DO IT AGAIN!**

1. Pass the beanbag around the circle again — as quickly as possible!
2. Say the name of the person who will catch the beanbag each time you pass it.
3. Try to “beat” your shortest recorded time.

**Hints:**
You may move around. You may stand or sit.
Playful Building: Team Machine

- **Inclined planes make it easier to move something up or down.**
- **An object can be**
  - lifted straight up (shorter distance)
  - or it can be pushed diagonally up an inclined plane (uses less energy)
Playful Building: Team Machine

- Inclined planes make it easier to move something up or down.

- An object can be
  - lifted straight up (shorter distance)
  - or it can be pushed diagonally up an inclined plane (uses less energy)

- A screw is a type of inclined plane that has been wrapped into a spiral shape
Poll 2
Activity 3: WATER WEDGES
This kayak is an example of a boat that has a wedge-shaped bow.

This paddleboat has a squared front edge.
• Activity:
  – Fold an origami boat!
A raft pushes water along in front of itself.

A boat with a bow slices through the water, allowing the boat to move forward more easily.
Activity 4: LEVERS AT PLAY
Using Stories to Provide Context

Mouse climbed back up to the top.

He waited...

...and he waited.

“Must be too light,” said Mouse.

“Hmm. Watermelons are heavy. Why don’t I eat one?”

But the seesaw didn’t move.

“I would be too heavy,” said Elephant.

“Brilliant idea!” cried Elephant.
Your Seesaw Design

THINK and BUILD
1. Pick the materials you think would be best for building a seesaw.
2. Together, plan how you will use the materials to build the seesaw. 

BUILD and TEST
3. Follow your plan to create your model seesaw.

DO IT AGAIN!
Modify your design — but change only one thing at a time!
Activity 5:
LOW-TECH WATER FILTER FOR HIGH-IMPACT CLEAN
Playful Building: Water Filter

• Water features are popular choices/wishes for parks

• Many parks face the challenge of getting clean water or keeping water clean

• Contaminates:
  – Leaves and twigs and sediment get into the water
  – Algae and bacteria live in the water
  – Pesticides and other substances run off from the land and into the water
Playful Building: Water Filter

What types of materials do you think could be used to construct a water filter?
Playful Building: Water Filter

- Offers an engineering challenge to the children in your programs:
  
  *How do I create a way to clean my park’s water?*

- Uses the Engineering Design Process
Playful Building: Water Filter

• Think:
  – What materials will work best to clean the water?
  – Which will work best for twigs and leaves?
  – Finer sediment?
  – Pesticides?
Playful Building: Water Filter
Playful Building: Water Filter

• Activity:
  – Use common materials to design a water filtration device to supply the park / water feature with clean water
  – 15 to 30 minutes; longer for children who like to experiment
  – Plastic water/soda bottles, variety of filtration materials, access to water
  – Can get a little messy!
  – Don’t drink the water!
Playful Building: Water Filter

- **Procedure:**
  - Build a water filter
  - Test:
    - 1 material at a time
    - What happened?
  - Do It Again: Think about what you observed, test another material and repeat the process
Playful Building: Water Filter

• Next, think about what combination of materials – in what order – will provide the best filter

• Build

• Test
Playful Building: Water Filter

• Compare!
• Which combination and in what order worked best?
• Can you get the water cleaner?
• Can you filter the water faster?
• Do It Again!
Some people in Bangladesh use cloth to clean their water...

Credit: National Science Foundation
...to take out small creatures in the water that help spread disease

Credit: National Science Foundation
Students help clean water in Nepal

4. What types of materials do you think could be used to construct a water filter?

Credit: Engineers without Borders
Playful Building: Water Filter
Activity 6: WIND TURBINE TECH CHALLENGE
There are two different types of wind turbines...

Horizontal Axis Wind Turbine

Credit: Gary Halvorson, Oregon State Archives, via Wikimedia Commons
Vertical Axis Wind Turbine

Blades

Tower

Credit: Lynne Kirton [CC-BY-SA-2.0 (http://creativecommons.org/licenses/by-sa/2.0)], via Wikimedia Commons
• Activity:
  – Use common materials to design a wind turbine to supply the park with electricity
  – 15 to 30 minutes; longer for children who like to experiment
  – Soda straws, Post-It note pads, play-doh, toothpicks
Build your own wind turbine!

**BUILD and TEST**

1. Push the four toothpicks into the putty so that they stand upright. Keep them close together.

2. Put a small scrap of paper at the bottom of the toothpicks. This will keep the straw from sticking!

3. Stick the Post-it notes to one end of the straw. Make sure they don’t cover each other!

4. Slide the straw over the toothpicks.

5. Use a second straw to gently blow across the blades.
Make it even better!

DO IT AGAIN!
Modify your design — but change only one thing at a time!

THINK, BUILD, and TEST
- Which different material could you try using?
- What else can you try changing?
  - The angle of the blades?
  - The size of the blades?
  - The shape of the blades?
  - Could the blades be more curved (cupped)?
  - Less curved?

Talk
Explore
Write
Draw
 THINK
BUILD
TEST
DO IT AGAIN!
Next, think about what type of materials will create the best wind turbine.

- Build
- Test
Playful Building: Wind Turbine

• Activity:
  – Use common materials to design a wind turbine to supply the park with electricity
  – 15 to 30 minutes; longer for children who like to experiment
  – Soda straws, Post-It note pads, play-doh, toothpicks
  – Paper towel tube, corrugated cardboard, tape
Playful Building: Wind Turbine

- Compare!
- Which size/shape and/or material worked best?
- Can you get the blades to spin faster?
- Do It Again!
IDEAS FOR MAKING THIS YOUR OWN!
Plan
Activity 1: Design a Park

Play
Activity 2: Team Machine
Activity 3: Water Wedges
Activity 4: Levers at Play

Power and Protect
Activity 5: Low-tech Water Filter for High-impact Clean
Activity 6: Wind Turbine Tech Challenge
Other Ideas...

Statewide Afterschool Networks

www.statewideafterschoolnetworks.net

The statewide afterschool networks foster partnerships and policies to develop, support and sustain quality afterschool and expanded learning opportunities for children and youth.

The Connectory

www.theconnectory.org/provider-portal

The Connectory is the largest database of STEM program providers where you can search for and discover new partners and share resources.
Other Ideas...

National Girls Collaborative Project

www.ngcproject.org

The National Girls Collaborative Project™ (NGCP) is designed to reach girl-serving STEM organizations across the United States.

Aspire

aspire.swe.org

This Society of Women Engineers (SWE) K–12 outreach program offers resources and events designed to share the excitement of engineering with girls in grades K–12.
DISCUSSION
Resources

• “Dream Big to Build a Better World”
  • Blog
  • Webinar archive (12/14/2016)

• Upcoming Special Event:
  Engineers Week: February 19-25, 2017

• STEM Activity Clearinghouse
THANK YOU!!

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