
Volume 1

Innovation Challenges: Mind Workouts for Teams



Sridhar Condoor and Gregory Keogh

Overview



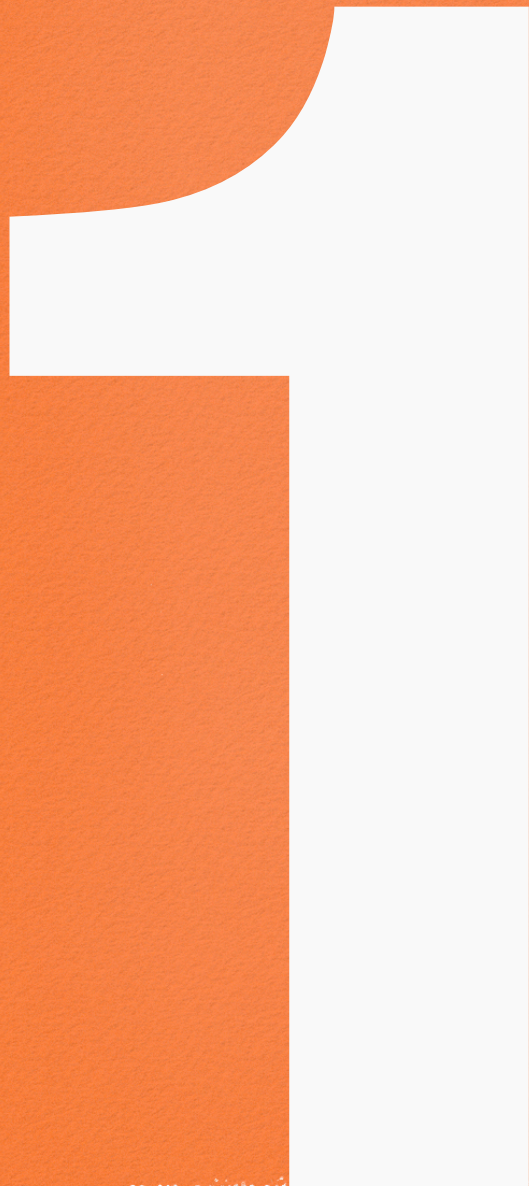
Curiosity



Connections



Creating Value



Goal

The goal of the innovation challenges is to promote the entrepreneurial mindset through multiple exposures to innovation process in a competitive, multidisciplinary, team-based, creative environment. Just as everyone is encouraged to exercise every day to keep the body fit, innovation challenges are designed to keep the mind fit. It's a mind workout. The Innovation Challenges help participants to exercise their creative side, work in multidisciplinary teams, and experience the team dynamics. They learn to tackle a novel situation under intense competitive time pressure, while networking with others outside their disciplines, and most importantly, fine-tuning their entrepreneurial skills.



Market the Challenge

The challenge becomes a real challenge only when many teams seriously compete. Promoting the challenge is therefore a key to success. Advertise and incentivize the competition to encourage initial participation. Use flyers, banners, newspapers, student groups, and social media to promote the challenge. Positively push the challenge as an opportunity to not only win prizes, but also to network and develop their personal skill set. A sample pitch for the challenge is shown in the video above. Give T-shirts and other items to spread the information about the challenge. Once the competition begins, the word-of-mouth becomes the best marketing tool.

Time and Location

We recommend conducting the challenges regularly at the same location. For instance, it can be held each week or each month on a certain day from Noon to 1:00 pm. As it is held at the same location and time, the challenges can easily be integrated into the participants' weekly or monthly routine. A typical challenge runs for one hour from start to finish. Promote the challenge time as a creative break from the busy daily routine work for the participants.

While selecting the location, look for the following features:

- **Central space** – a central location which can attract a number of participants and readily accessible.
- **Open space** – an open area that can accommodate the participants. Anticipate growth in the numbers as the challenges become popular.
- **Public space** – a place where a number of people will pass through. As people pass through the challenge location (while leaving or entering the building during lunchtime), it attracts attention. It attracts passers-by to participate in future challenges or watch the final stages. These students bring intense competitive spirit by cheering their peers. Further, the public recognition is an ultimate incentive for any team.



Team Formation

Open the challenge to the teams of exactly three members. To encourage multidisciplinary collaboration, require the team members to be from different disciplines. Enforce the multidisciplinary requirement for an effective team learning experience.

Depending on the culture of the institution, some participants form their teams ahead of the challenge time and come to the challenge. Several participants come to the challenge without forming their teams. The organizer's role is help them to form teams. The team member may get to know each other briefly before the challenge.



Three C's - Fostering the entrepreneurial mindset

The entrepreneurial mindset is not just about startups. It powers industries, transforms companies from within, and creates value for employees and customers alike. And now, the combined work of faculty from the several universities in the United States has revealed the three core components of the entrepreneurial mindset...

Curiosity

Curiosity is being inquisitive about the ever changing world around us. It helps us to identify incongruencies that can lead to scientific discoveries, new opportunity identification, and experiential learning. These challenges require participants to investigate a rapidly changing world with an insatiable curiosity.

Connections

Connections Discoveries, however, are not enough. Information only yields insight when connected with other information. We must teach our students to habitually pursue knowledge and integrate it with their own discoveries to reveal innovative solutions.

Creating Value

Creating Value Innovative solutions are most meaningful when they create extraordinary value for others. Therefore, students must be champions of value creation. As educators, we must train students to persistently anticipate and meet the needs of a changing world.

Table of Challenges

Challenge (page no.)	Description	Curiosity	Connections	Creating Value
Marshmallow Challenge (8)	Build the tallest freestanding structure that can support a marshmallow	✓	✓	
Queen Bee Challenge (11)	Build the tallest tower-- blindfolded worker bees build while queen bees can only instruct		✓	
Aesthetic Bridge Challenge (14)	Build an aesthetic bridge that supports a certain weight and spans a given gap	✓	✓	✓
Scavenger Hunt (17)	Hunt the location of a close up picture hint	✓	✓	
Raft Challenge (20)	Build the cheapest raft that can float a certain weight and travel a given distance using wind power	✓	✓	
Electric Outlet Marketing Challenge (23)	Create the product presentation for a surge protector	✓	✓	
Elevator Pitch Challenge (26)	Pitch your idea to add a healthy breakfast on campus in 90 seconds			✓
Newspaper Table Challenge (29)	Build the tallest table using newspaper to support a ream of paper	✓	✓	
Outsourcing Challenge (32)	Recreate lego-planners make assembly instructions and a builder assembles			✓
Balloon Plane Launch Challenge (35)	Launch a paper plane using a helium balloon. The longest hovering plane wins.	✓	✓	
Game Theory Challenge (38)	Play a series of game theory games and earn points	✓		

Challenge	Description	Curiosity	Connections	Creating Value
Student Desk Challenge (41)	Prototype a student desk for a dorm room	✓		✓
Space Launcher Challenge (44)	Build a device to launch ping-pong balls through a suspended ring	✓	✓	
Incorporating Best Practices (47)	Bring a global best sustainability practice to a local level	✓		✓
Supply Drop Challenge (55)	Protect two glass candle holders from a two-story drop	✓	✓	
Toaster Box Design Challenge (53)	Design an appealing packaging for a toaster to a “green” shopper.		✓	✓
Gmail Improvement Challenge (56)	Pitch improvements to Gmail	✓		✓
Refuse Bird Feeder Challenge (59)	Build an aesthetic bird feeder from trash materials.	✓		✓
Puzzle Race (62)	Complete a given set of puzzles. The fastest team wins.	✓	✓	
Code Transmission Challenge (65)	Develop a code that can securely relay a message across a 20 ft. gap.		✓	✓
Rubber Band Car Challenge (68)	Build a car powered by a rubber band to travel the farthest distance.	✓	✓	
Foil Boats (71)	Create a boat to float the most quarters.	✓	✓	✓

Branding the Challenge

The logos for the innovation challenge, weekly innovation challenge, and monthly innovation challenge are available for use by others upon request. Additional resources include templates for blade banners, banners, flyers, table clothes, T-shirt designs, the team check-in forms, winner certificate, and problem statements. Email Dr. Sridhar Condoor (condoor@slu.edu) for permissions or additional resources.



Marshmallow Challenge



Curiosity

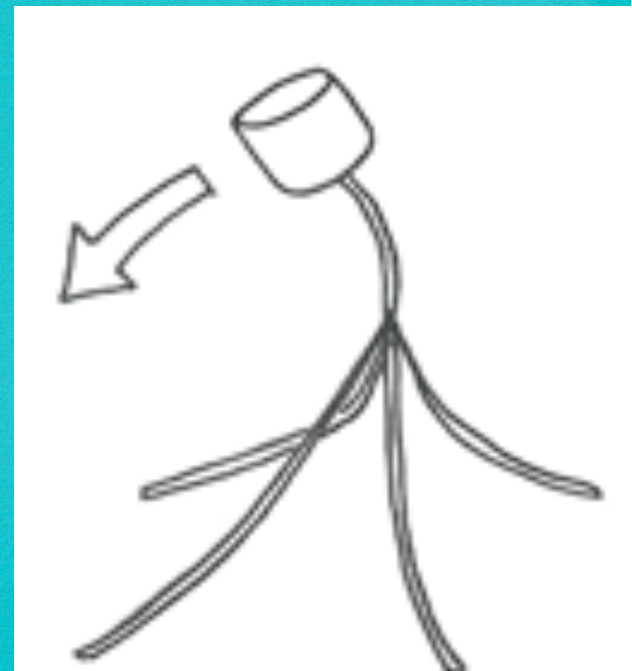


Connections



Creating Value

Build the tallest freestanding structure that can support a marshmallow.



Marshmallow Challenge

The Challenge

Build the *tallest* freestanding structure.

The height is measured from the base of the structure to the top of the marshmallow.

The structure cannot be suspended or supported by another structure. The structure must be made from the materials supplied.

The whole marshmallow must be on the top of the structure.

Use as much or as little of the materials. The spaghetti, string, and tape may be broken and cut as desired.

Time limit: 18 minutes.

Team Supplies

spaghetti (20 sticks per team)

string (1 yard per team)

scissors

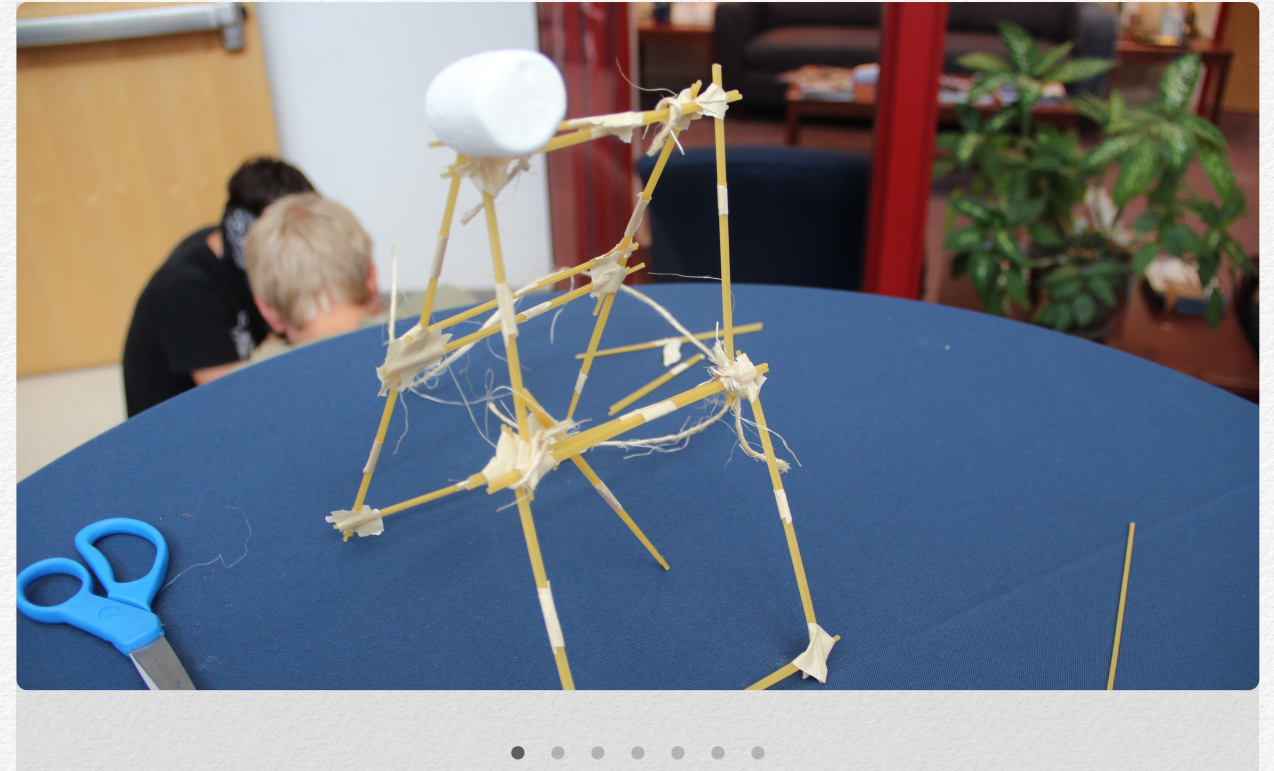
masking tape (1 yard per team)

marshmallows (1 per team,
standard size no mini or jumbo)

Facilitator Supplies

tape measure

stopwatch preferably one that can
project how much time is remaining



Facilitator Tips

1. **Watch the TED talk - Tom Wujec - Build a tower, build a team** at http://www.ted.com/talks/lang/en/tom_wujec_build_a_tower.html
2. **Enforce the time limit.** It allows participants to benchmark their skill level using the TED talk.



Learning Outcomes

The marshmallow in the challenge is a metaphor for the hidden assumptions of a project. The assumption here is that marshmallows are light and fluffy and easily supported by spaghetti sticks. When you actually try to build the structure, the marshmallows don't seem so light. The lesson in the marshmallow challenge is that we need to identify the assumptions in our project - the real customer needs, the cost of the product, the duration of the service - and test them early and often. That's the mechanism that leads to effective innovation - marshmallowchallenge.com

Typically, only half of the teams have standing structures after 18 minutes. Prototyping and testing during the entire process offers ample opportunities for corrections.

Team dynamics is essential for successful completion of a standing tower. If team members focus on trying to be CEO of Spaghetti Inc., then they tend to argue more and build less.

Lessons:

- 1. Plan under tight time constraints*
- 2. Prototype quickly*
- 3. Identify the hidden assumptions*

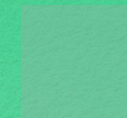


Variations

- 1. Allow participants to build tower twice.** Provide fresh supplies each time and take the last height measurement. This variation allowed the participants to take risks in the first try and learn from failure.
- 2. Split the participants into two groups.** Provide the learning outcomes to one of the groups. After the competition, engage the groups in a discussion on how they designed differently.

This Challenge was adopted from marshmallowchallenge.com

Queen Bee Challenge



Curiosity



Connections



Creating Value

3

Build the tallest tower. Worker bees who are blindfolded build while queen bees can only instruct.



NO PEEKING !

Queen Bee Challenge

The Challenge

Build the *tallest* freestanding tower.

The height is measured from the base of the tower to the top.

Up to two team members can act as worker bees.

Worker bees are blindfolded and are the **ONLY** ones who can touch, move, modify, and build the supplies.

The other member(s) act as queen bee(s) and can provide **ONLY** oral instructions.

Any peeking results in disqualification.

Time limit: 10 minutes to plan before the blindfolds go on, and 40 minutes to build the tower

Team Supplies

- 10 plastic cups (red solo)
- 10 styrofoam cups
- 10 small paper cups (dixie)
- 2 blindfolds
- 1 roll scotch tape

Facilitator Supplies

- tape Measure
- stopwatch



Facilitator Tips

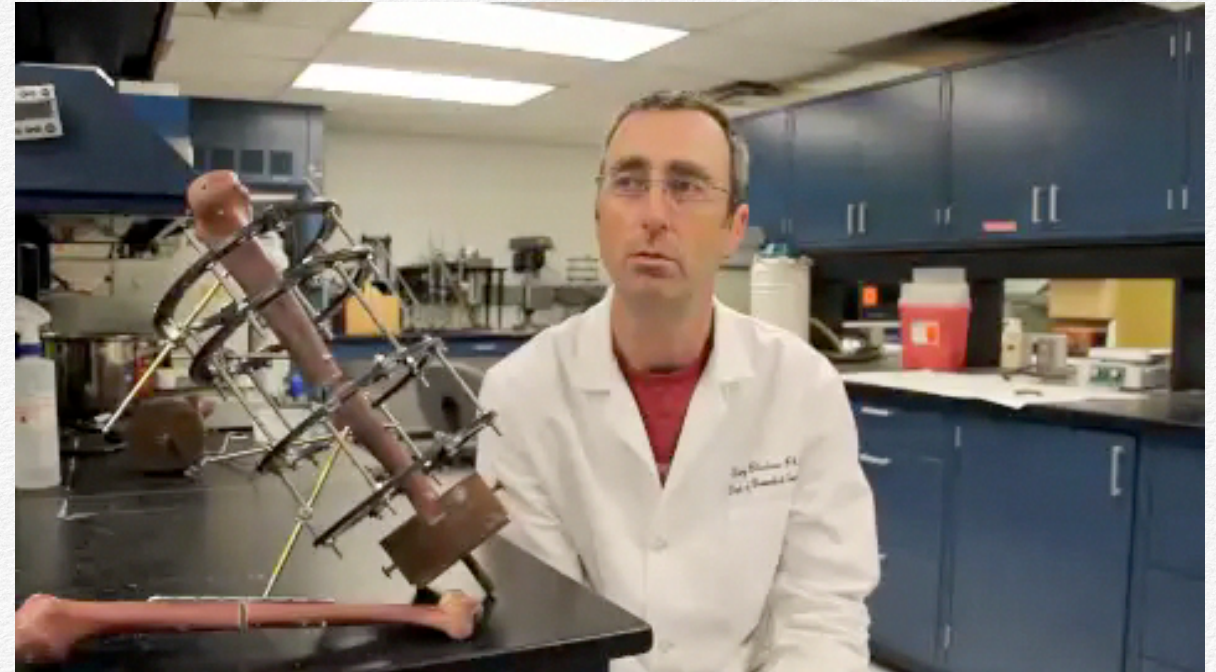
- 1. Once a team decides the number of worker bees, they can't change their decision.**
- 2. Provide tables.** If the team chooses to work on the table instead of the floor they'll have a harder time.
- 3. Vary cup sizes to add difficulty.**

Learning Outcomes

The Queen Bee Challenge stresses the need for planning, communication, and trust. The blindfold is a metaphor for following instructions in total belief of other team members.

Lessons:

- 1. Emphasize the importance of planning as it reduces the need for a higher degree of communication.*
- 2. Communicate precisely.*
- 3. Trust the team and understand mutual dependency.*
- 4. Overcome perceived and real barriers.*



Variations

- 1. Blind men's tower:** Teams have 15 minutes to plan and after that all team members are blindfolded.
- 2. Limit the amount of tape.**
- 3. Predetermine the number of queen and worker bees as 1 and 2 or 2 and 1 respectively.** Particularly, two queen bees and one worker bee combination is useful when the blindfolds are limited.
- 4. Add an additional requirement for the tower to support weight.**

Aesthetic Bridge



Curiosity



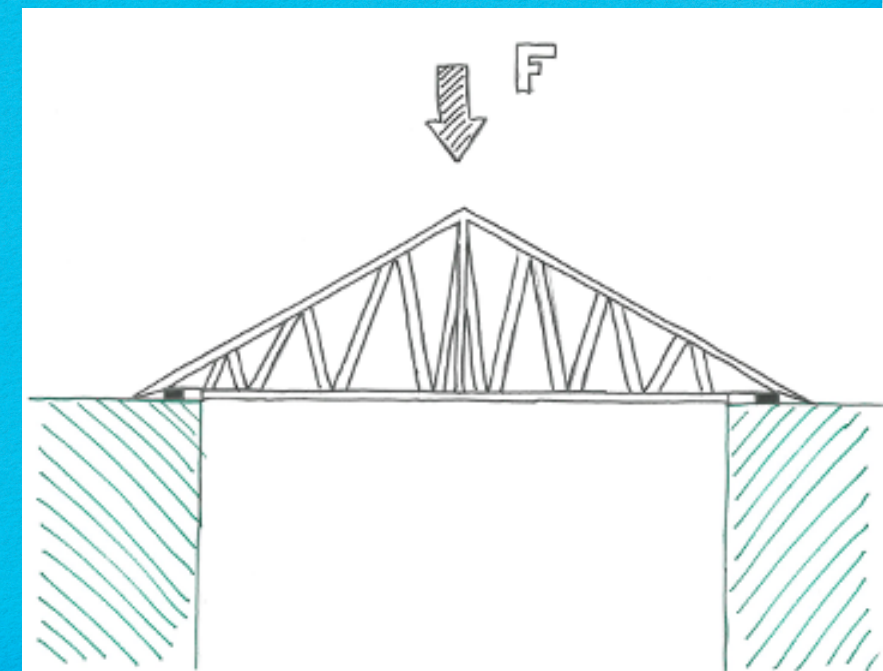
Connections



Creating Value

4

Build an aesthetic bridge to support a certain weight and span a given gap



Aesthetic Bridge Challenge

The Challenge

Build an *aesthetically appealing* bridge with 1 ft span. It must support 3 lb.

Use as much or as little material as you want.

Provide a sketch and the exact amount of material that you need to get your supplies.

You can pick supplies twice.

Judges pick the *prettiest* bridge from entries that can support the weight wins.

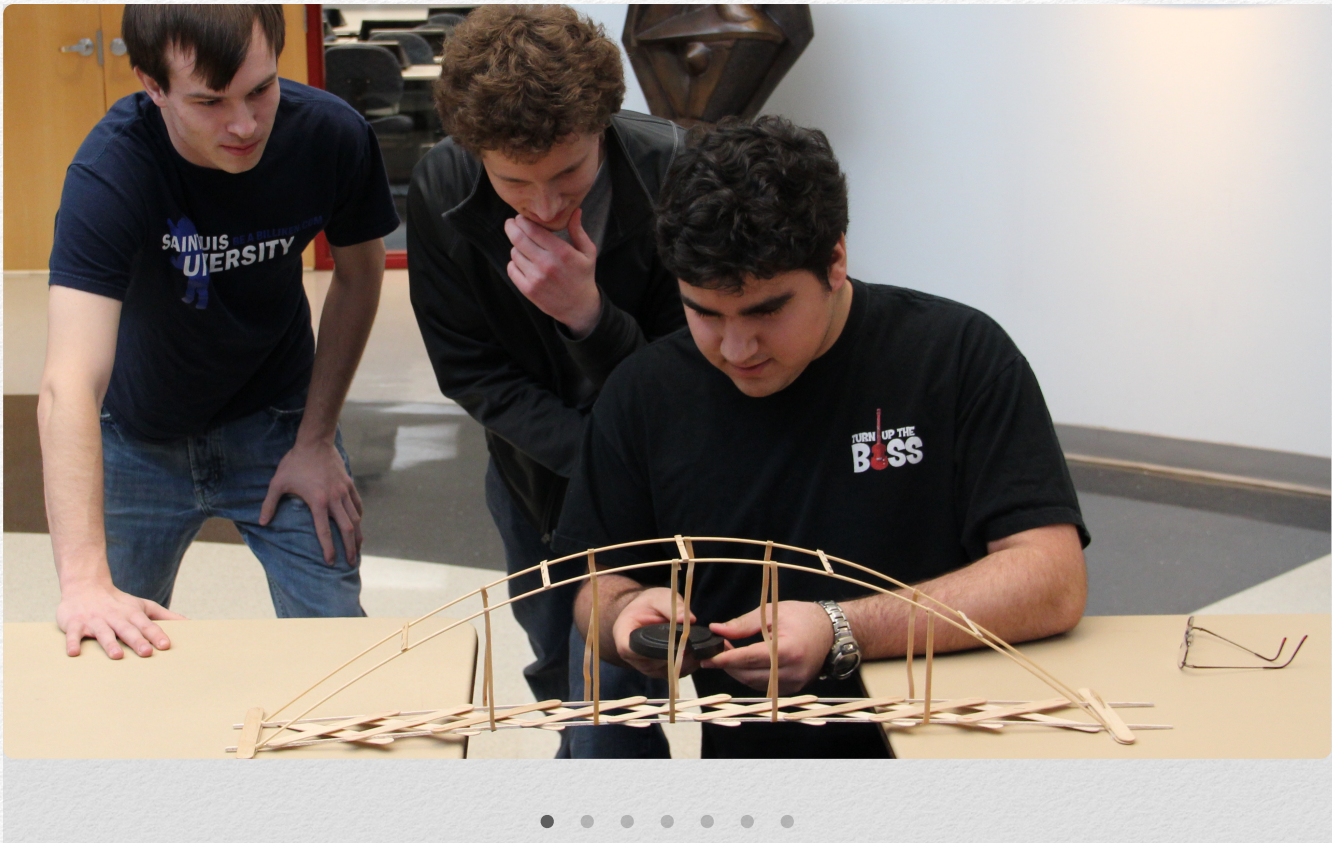
Time limit: 50 minutes

Team Supplies

popsicle sticks, toothpicks, straws, construction paper, wood dowels (assorted sizes), duct tape, masking tape, scotch tape, scissors, rulers, aluminum foil, saran wrap, cardboard, spaghetti, glue, paper, markers, colored pencils, colored felt, scissors

Facilitator Supplies

table to act as “supply depot”
3 lb weight
gap for the bridges to span (two tables)
stopwatch



Facilitator Tips

Display all the supplies on a table.

Make sure that participants have a sketch and material list before receiving supplies.

Offer a variety of materials. With a varied material supply, the the bridges become more interesting.

The span of the bridge, the weight that must supported, and the challenge time can varied.



Learning Outcomes

When designing and building, engineers tend to focus on functionality. This challenge breaks their natural tendency and forces the participants to equally value functionality and aesthetics. Also, making the participants justify the materials needs teaches two valuable lessons - planning and reducing waste.

Lessons:

1. *Appreciate aesthetics*
2. *Meet required functionality*
3. *Prototype quickly*
4. *Use readily available materials*

The challenge shows how one can quickly make aesthetic and functional prototypes from inexpensive, readily available materials.

It also teaches participants to “get hands dirty” and “do something” - start building. The abundance and variety of the materials encourages them to try innovative solutions.



Variations

1. **Reduce the time.** It introduces an element of stress and urgency to the challenge. The urgency can cause team members to split their focus on functional and aesthetic requirements and can result in interesting team dynamics.
2. **Vary what needs to be built.** Any design that focusses on a functional requirement such as the ability to carry certain weight and aesthetics will work.
3. **Limit the resources** or give teams iNotes to buy supplies. It makes the challenge multifaceted. Assign higher costs for things that are likely to be more essential.

Scavenger Hunt



Curiosity



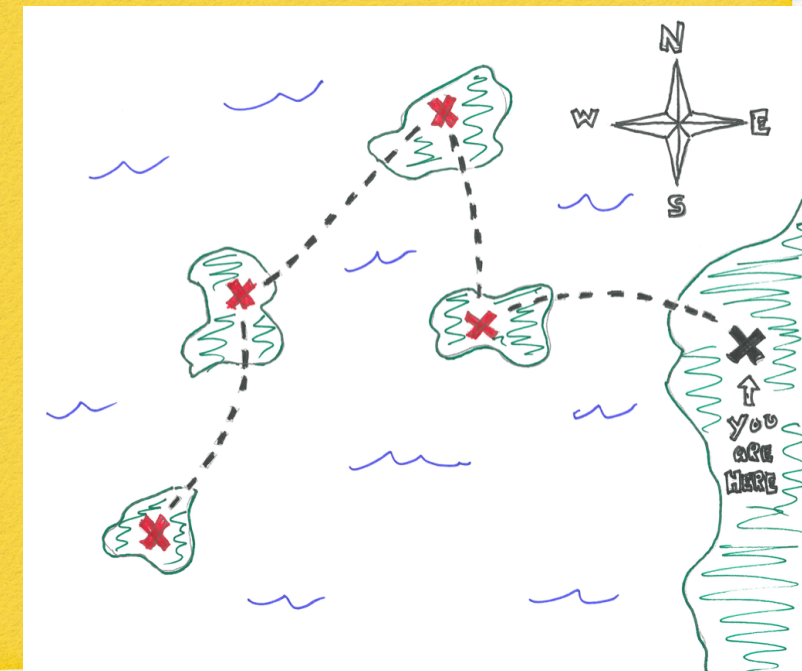
Connections



Creating Value

5

Hunt the locations of close up pictures



Scavenger Hunt Challenge

The Challenge

Take pictures with artifacts or people whose clues are provided on the sheet. The team with most correct pictures wins. In the event of a tie, the fastest one wins.

Time limit: 50 minutes

Team Supplies

sheet of zoomed in pictures of artifacts to be identified.

tasks such as meet a certain person (librarian, director,..) to perform

Facilitator Supplies

stopwatch



Facilitator Tips

- The clues are pictures of artifacts that participants see daily. Present a part of the artifact or zoom in to increase difficulty.
- Include tasks to increase participants' awareness of available resources.
- Perfect for an outside activity - **watch the weather conditions.**



Learning Outcomes

The Scavenger hunt is both fun and challenging. The close up pictures serve to provide a different viewpoint of everyday things which can translate well into design. Many images may not be immediately decipherable so the participants may have to walk around to find the artifacts. Observing everyday artifacts and viewing the world differently is at the heart of innovative design.

Lessons:

- 1. Observe everyday things*
- 2. Pay closer attention to surroundings*
- 3. Aware of available resources*



Variations

- 1. Limit the radius of scavenger hunt by appropriately selecting artifacts.** Artifacts can be from one room, one building, or one city block.
- 2. Participants must identify artifacts instead of taking pictures.** Reduces the walking time.
- 3. The pictures could be from a set of magazines or from web.** The participants must find the sources.

Raft Challenge



Curiosity

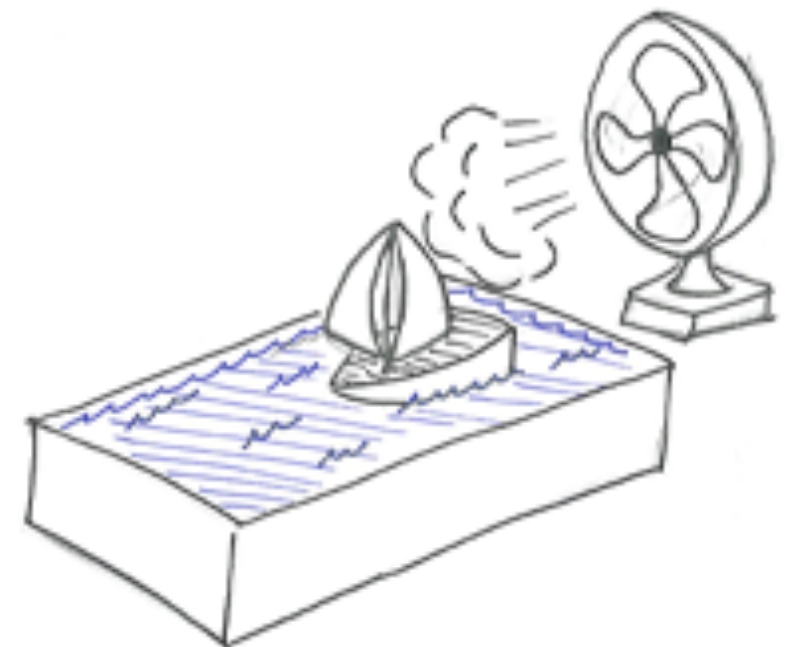


Connections



Creating Value

Build the cheapest raft to float a certain weight and travel a given distance using wind power.



Raft Challenge

The Challenge

Build the *cheapest* raft to support a 0.5 lb weight. It must travel 2.5 feet on water using wind power.

The weight should not get wet.

A fan at one end of the water provides the wind.

Use iNotes to buy supplies.

The lowest cost design that keeps the weight dry and travels the distance wins. In the case of a tie, the fastest raft that keeps the weight dry wins.

Time limit: 50 minutes

Team Supplies

card stock paper, aluminum foil, saran wrap, assorted size popsicle sticks, spaghetti, assorted wood dowels, duct tape, glue, rubber bands, scotch tape, masking tape, straws, scissors

Facilitator Supplies

tub for raft to float across
fan
iNotes
a breakdown of the cost per material supplied
stopwatch



Facilitator Tips

Add more materials based on availability.

Assign higher costs for things that are likely to be more essential.

Use a miniature mascot as the weight to actively engage participants.



Learning Outcomes

The Raft Challenge mimics the real world marketplace. Creating the lowest cost design that satisfies all requirements gives a competitive advantage particularly when the products reach a commodity status.

Lessons:

1. *Evaluate material costs*
2. *Balance functionality and cost*
3. *Trim unnecessary features*

Trimming unnecessary functions and features helps to focus on minimalistic design - *required functionality at the lowest cost*.

The raft challenge sparks creativity by forcing unconventional use of low cost materials. For instance, one team made the raft using a strip of duct tape won the competition.



Variations

1. ***Build the fastest raft.*** The supplies are not limited.
2. Limit the iNotes so that people can buy limited supplies
3. Allow/encourage/force trading between the groups by requiring teams to buy supplies in bulk.

Electric Outlet Marketing



Curiosity

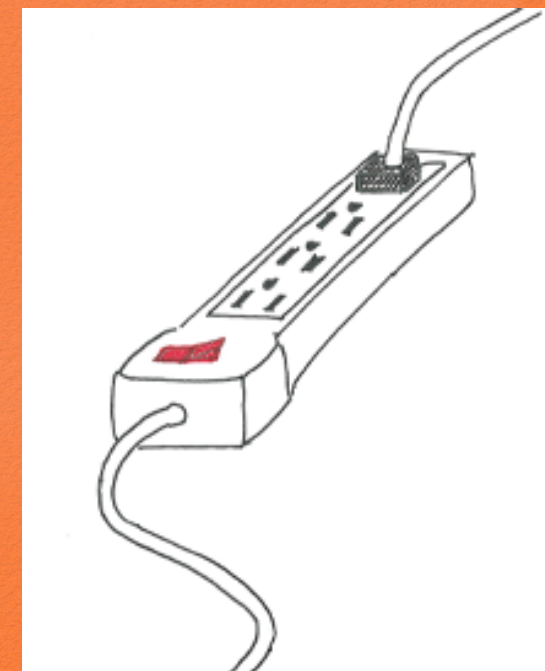


Connections



Creating Value

Create the product presentation for a surge protector.



Electric Outlet Marketing

The Challenge

Create a prototype model including the packaging of the project presentation in a showroom for an electrical outlet of your choice from

<http://www.designswan.com/archives/19-innovative-and-cool-electrical-outlets-sockets-and-switches.html>

Judges pick the winner based on its likelihood to sell (the ability to attract attention, display benefits, and look cool).

Time limit: 50 minutes

Team Supplies

scissors, construction paper, colored card stock paper, markers, colored pencils, aluminum foil, colored felt, cardboard, scotch tape, duct tape, masking tape, string

Facilitator Supplies

stopwatch
judge panel



Facilitator Tips

Make sure the participants know the judging criteria. The designs are judged by their ability to attract attention, display benefits, and look cool.

Add more materials based on availability.

Do not let participants pitch. The product and packaging should market and speak for itself, and should be judged away from participants to facilitate open discussion between the judges.



Learning Outcomes

The electrical outlet marketing challenge has the participants experience the role of product appearance and packaging in marketing. The focus should on the benefits of the products and its unique value proposition.

Also, participants learn to create the product and packaging prototypes quickly. While prototyping, participants must learn to view the products in the eyes of the customer and design accordingly.

Lessons:

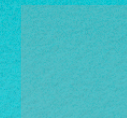
1. *Market based on product appearance.*
2. *Convey value with physical prototypes.*
3. *Design from the customer point of view.*



Variations

1. Use any product for which innovative ideas are available on the web.
2. Use real products to package.

Elevator Pitch Challenge



Curiosity



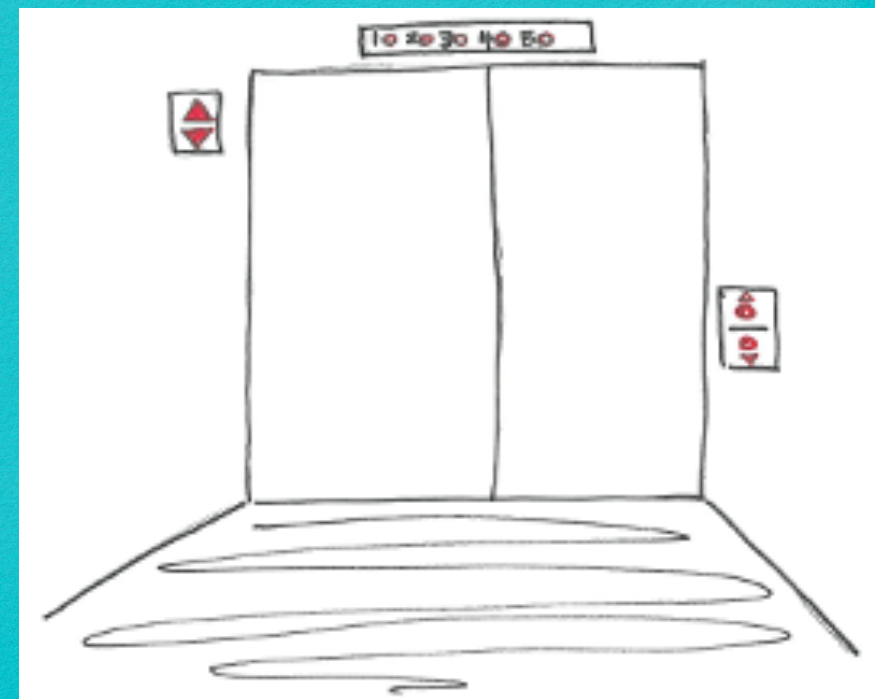
Connections



Creating Value

8

Pitch an idea to add a healthy breakfast on campuses.



Elevator Pitch Challenge

The Challenge

Pitch a way to improve breakfast consumption on college campuses. Earn *most* iNotes from the judges.

Breakfast is often skipped by most college students.

You will have 90 seconds to pitch the idea to a rotating set of judges.

The judges vote their choices by distributing iNotes.

The team with the most iNotes wins.

Time limit: 40 minutes to prepare the pitch

Team Supplies

poster board

markers

colored pencils

paper

Facilitator Supplies

judges

iNotes

stopwatch

whistle (to indicate time to rotate)

easels or ways to prop posters



Facilitator Tips

Space teams to reduce distraction during the pitch phase.

Rotate multiple judges and have one judge with a team at a time.

Give only 90 seconds.

Ask the judges to distribute iNotes after hearing all the pitches.



Learning Outcomes

The elevator pitch challenge stresses clear and concise communication. The time constraint forces participants to summarize the idea and a good value proposition clearly and quickly.

As the teams pitch multiple times, they can improve on and make corrections to their pitches. They also learn to time what and how much can be conveyed in 90 seconds.

Lessons:

- 1. Communicate efficiently*
- 2. Sell your idea*
- 3. Convey an unique value proposition*



Variation

Rotate the teams through a panel of judges. In this scenario, participants give only one pitch. But the space requirements are more manageable.

Newspaper Table



Curiosity



Connections



Creating Value

Build the tallest table using newspaper to support a ream of paper.



Newspaper Table Challenge

The Challenge

Build the *tallest* table to support a ream of paper using the newspaper provided.

The height is measured from the bottom of the newspaper table to the top.

The entire weight of the ream must be carried only by the newspaper.

Time limit: 50 minutes

Team Supplies

- one newspaper
- one ream of paper
- one scotch tape

Facilitator Supplies

- an extra newspaper per team
- stopwatch



Facilitator Tips

Give a second newspaper halfway through the competition.



Learning Outcomes

The challenge teaches the participants to quickly adapt to changing situations. Newspaper already is a nontraditional building supply and then receiving a second newspaper half-way through teaches adapting to changing environments. It teaches the value of creating scaleable designs.

Lessons:

1. *Adapt quickly.*
2. *Create scaleable design.*
3. *Learn from failure.*

This challenge illustrates the need for constant refinement of prototypes. Participants get a physical feel for the weight and constantly adjust the tower design to avoid failures.

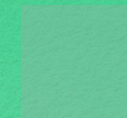


Variations

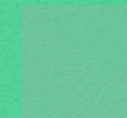
1. Change the difficulty by increasing or decreasing the number of reams at mid-point of the challenge.
2. Design 3 ft tower that can support a ream of paper for the lowest cost. Use iNotes to buy newspaper.

This Challenge was adopted from pbskids.org.

Outsourcing Challenge



Curiosity



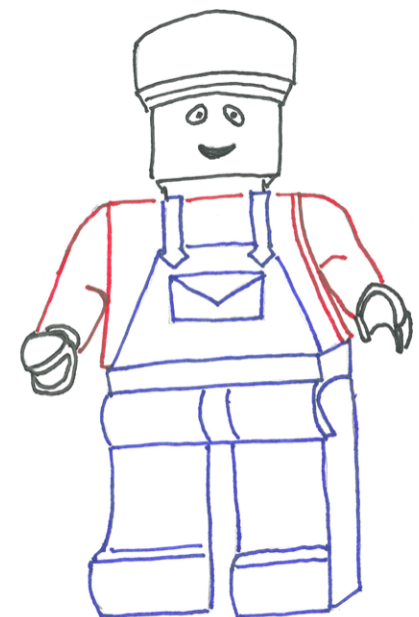
Connections



Creating Value

10

Recreate a Lego assembly. Planners create assembly instructions and a builder assembles.



Outsourcing Challenge

The Challenge

Create outsourcing assembly instructions and *accurately* reassemble the design. The team with the most accurate assembly wins. In the case of a tie, the fastest team wins.

The team designates two of their members as planners and one as a builder. The builder leaves the area for 30 minutes.

The planners create the assembly instructions for the assembly provided. They must disassemble the assembly.

After 30 minutes, the builder rebuilds the assembly using the instructions. The planners can observe from a distance, but can't give any input.

Time limit: 30 minutes for creating instructions, 20 minutes for assembling

Team Supplies

one assembled Lego set
paper
colored pencils
pens

Facilitator Supplies

assemble Legos before the competition
model lego set for comparison
stopwatch



Facilitator Tips

Cover the sets until builders leave the area.

Lego Friends make a perfect choice for this competition.

Emphasize on details to avoid ties.

Make sure that the sets are completely disassembled before the builders return.

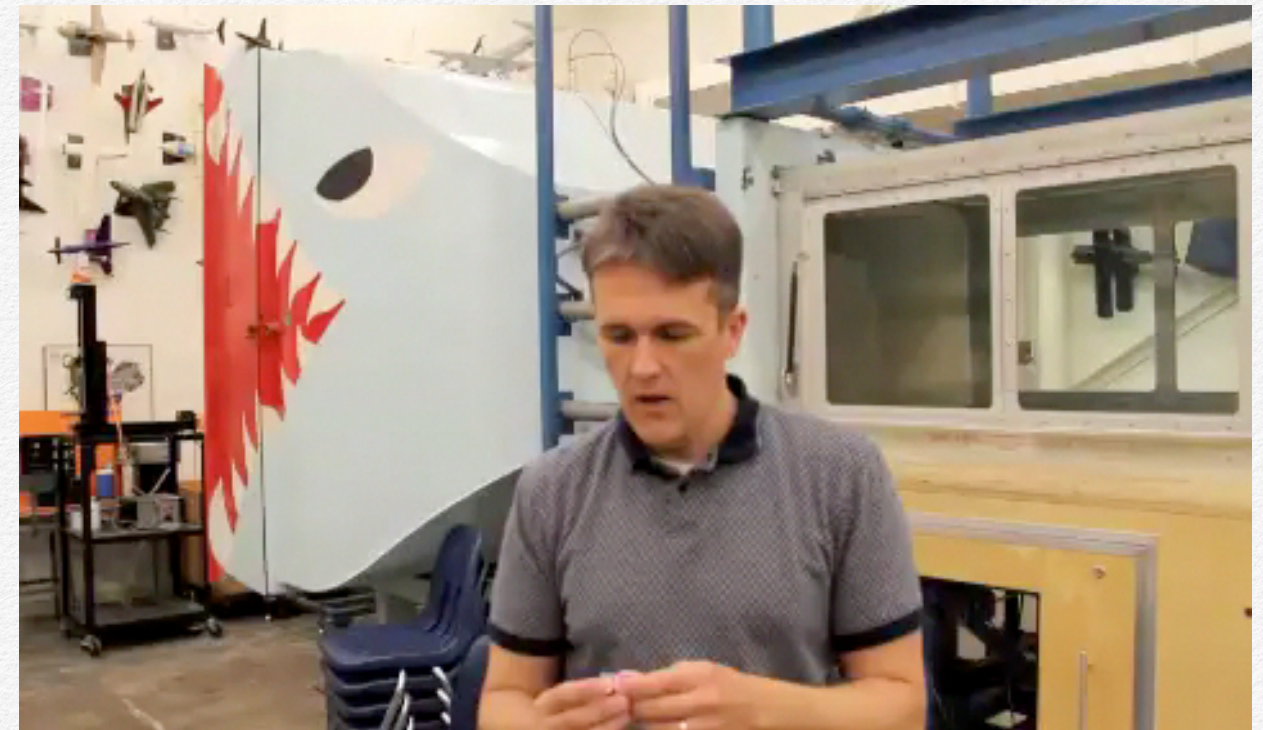


Learning Outcomes

The outsourcing challenge allows the participants to experience the frustrations and problems that arise from outsourcing manufacturing and assembling. The challenges illustrates how the quality of the product is determined by the clarity of assembly or manufacturing instructions.

Lessons:

1. *Communicate effectively using graphical and written instructions*
2. *Learn to create effective assembly sequence*



Variations

1. Substitute K'Nex or TinkerToys for Lego.
2. Challenge the teams to create recorded verbal instructions for simpler assembly tasks. May require the availability of recording devices (smartphones).

Balloon Plane Launch



Curiosity



Connections



Creating Value

Launch a paper plane using a helium balloon and the longest hovering plane wins.



Balloon Plane Launch Challenge

The Challenge

Launch a paper plane from a helium balloon. The plane that travels the *longest* time wins.

The time is measured from the release from the balloon to the landing.

Use the entire paper provided to make the plane.

Don't reduce the weight of the plane.

Time limit: 50 minutes to design and build

Team Supplies

helium Balloon

string

a piece of paper

scotch tape

Facilitator Supplies

stopwatch

scissors



Facilitator Tips

An open space with atrium type setting is ideal for this competition.

Provide a thick strand type string. Participants can reduce the string weight by unraveling.

Cut the string into equal lengths.

Secure the balloons.

Participants raise their balloons and release the plane one at a time, while the facilitator times.



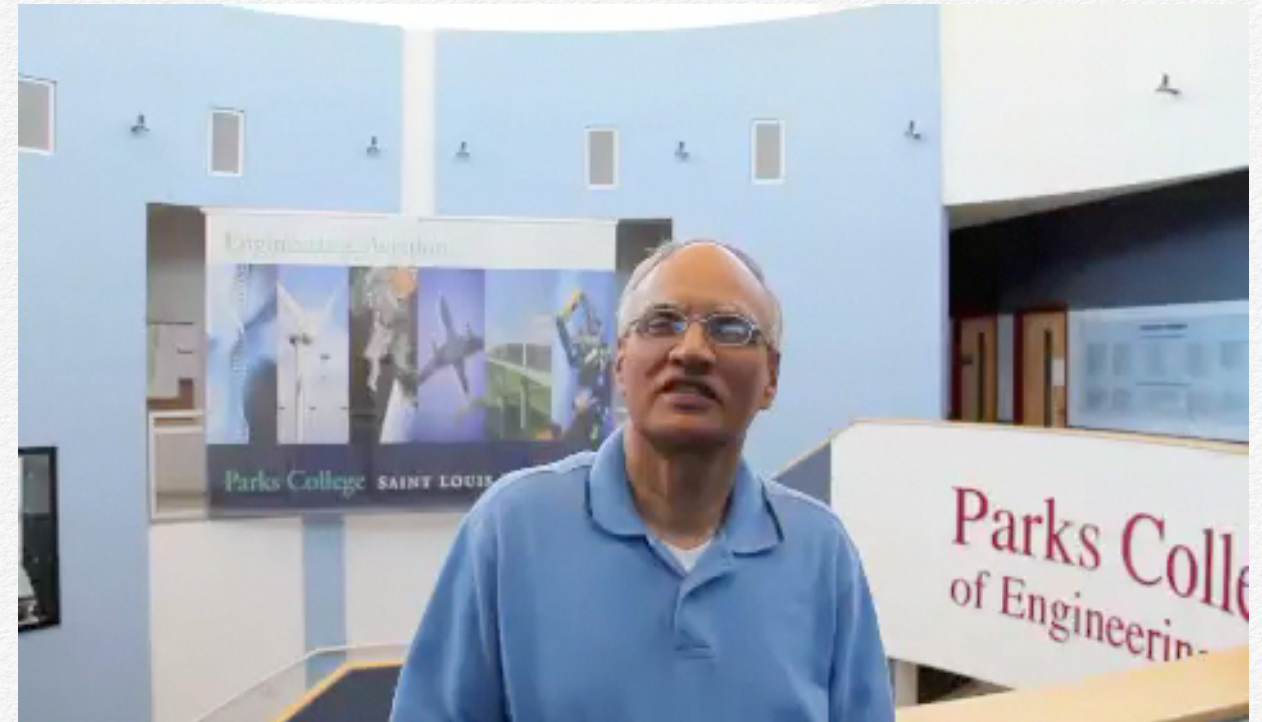
Learning Outcomes

Participants must consider the weight of the string and the plane, the plane design, and the release mechanism. The challenge presents itself as an easy venue for dividing the task. Integration issues become critical for the overall success.

Participants get a physical feel the weight of the paper and the weight that a helium balloon can carry.

Lessons:

1. *Prototype quickly*
2. *Synergistically integrate different parts of the design*
3. *Learn from failure*
4. *Cultivate physical intuition*



Variations

1. Allow the participants to modify the size and shape of the paper.
2. Provide multiple balloons and more supplies to foster more creative ideas.

Game Theory Challenge



Curiosity



Connections



Creating Value

12

Play a series of game theory games and earn points



Game Theory Challenge

The Challenge

Compete with the other teams in two game theory games and earn *maximum* iNotes.

In each game earn iNotes based on the outcome.

Teams face each other in the prisoner dilemma.

Teams rotate so that each team faces all other teams only once.

After completing the prisoner dilemma game, the teams play 12 rounds of the auction game.

The team with the most iNotes wins.

The game instructions can be found:

http://en.wikipedia.org/wiki/Prisoner%27s_dilemma

http://en.wikipedia.org/wiki/Dollar_auction

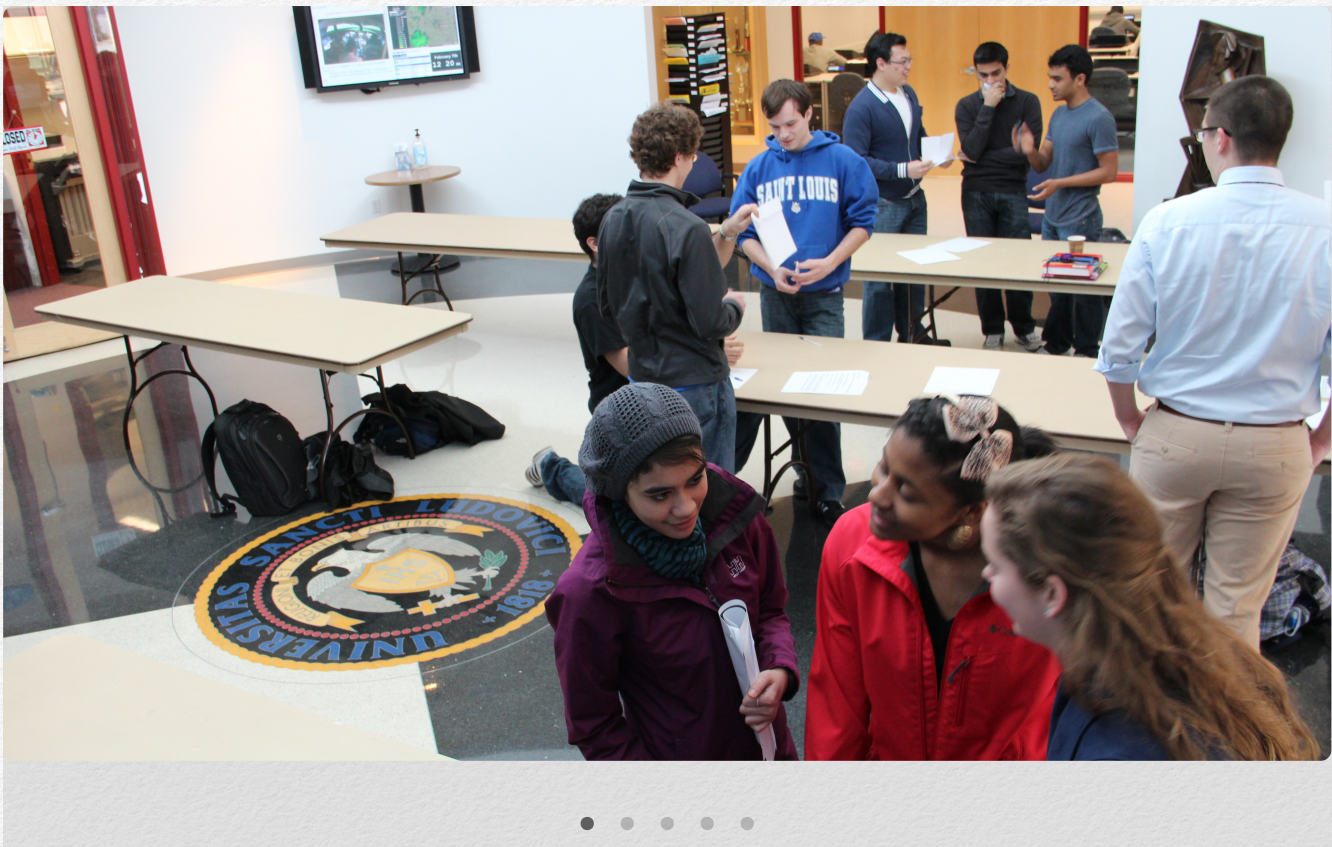
Time limit: 30 minutes prisoners dilemma, 20 minutes auction

Team Supplies

printed game instructions
paper

Facilitator Supplies

iNotes
stopwatch



Facilitator Tips

Allow the participants to converse with each other for about a minute before they play the games.

Change the games to fit with monetary reward i.e., in the prisoner dilemma change going to jail or going free to dollar amounts.

Run the auction game a number of times to a point where people begin to run out of money. 12 is recommended.



Learning Outcomes

The games theory stresses the importance of cooperation for a success. The competitive environment makes participants not cooperate with each other. Game theory teaches the value of competing in a market segment and also, cooperate with competitors to push industry standards and values.

Lessons:

1. *Strategize in a competitive market space*
2. *Learn the importance of cooperative-competition.*
3. *Change the mindset about competition*



Variation

Participants play the same game multiple times against each competitor. The iteration helps build trust and makes the outcomes much more interesting. Adjust the time to accordingly.

Student Desk Challenge



Curiosity



Connections



Creating Value

13

Prototype a student desk for
a dorm room



Student Desk Challenge

The Challenge

Design and prototype a student desk for a dorm room with the materials given. Judges will choose the best design based on utility and aesthetics.

Time limit: 50 minutes

Team Supplies

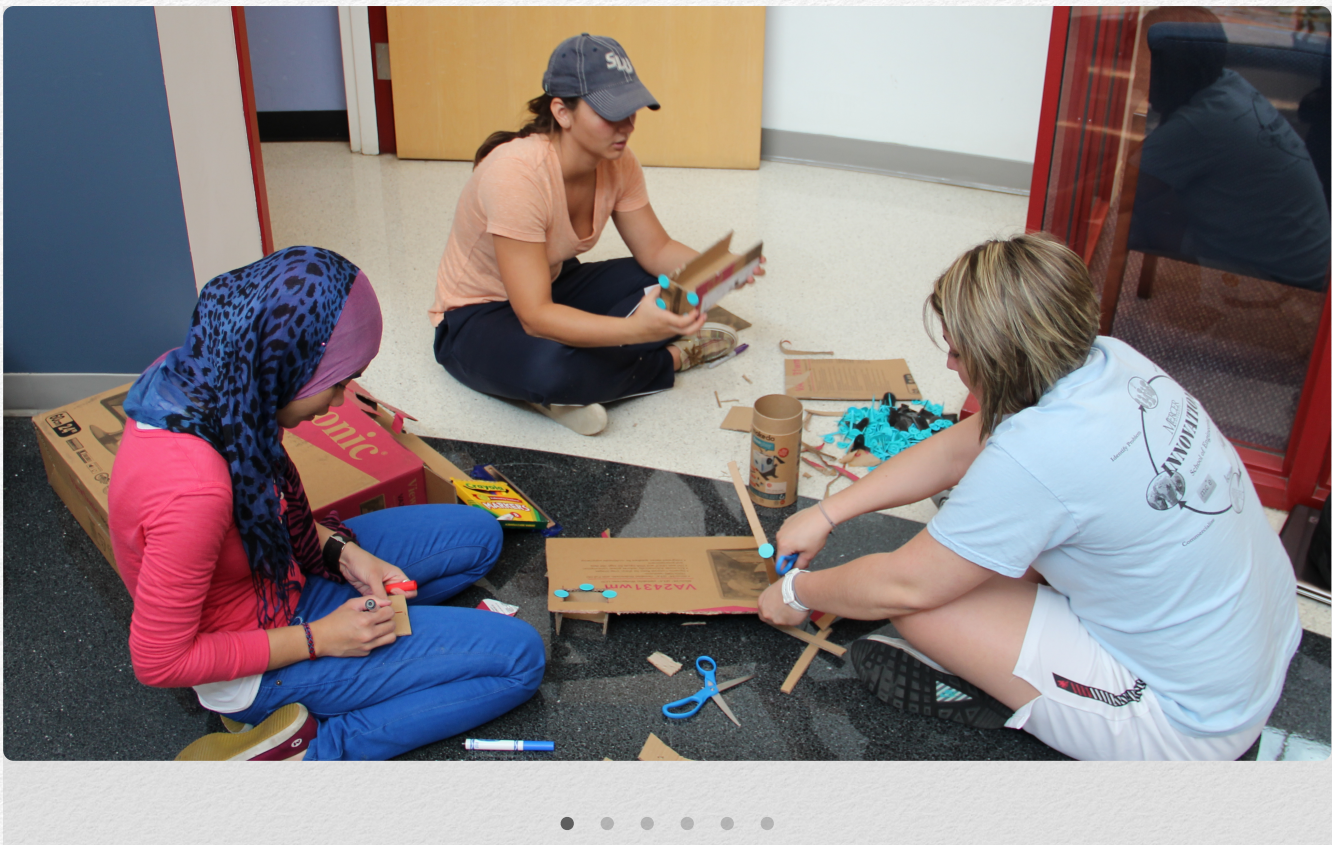
cardboard, colored paper,
scissors, box cutters, markers,
string, scotch tape, duct tape,
masking tape

makedo set:

<http://mymakedo.com/>

Facilitator Supplies

judge panel
stopwatch



Facilitator Tips

Be careful with the students using box cutters.

Use non-participating students as judges.

Judges don't meet students and only see the final prototype.

Prototypes need not be full size.

Makedo set is a recommendation. An alternative to makedo is to offer a lot of prototyping supplies like wood dowels, popsicle sticks, styrofoam blocks, card stock paper, colored felt, hot glue, foil, etc.



Learning Outcomes

The challenge requires students to get out of a paradigm that they are intimately familiar with and used to. They must conceive an idea for the desk that solves some of their own (realized or unrealized) pains, build a prototype to illustrate its features, and then market its benefits to the judges. Thus, the challenge makes the participants consider multiple design facets

Lessons:

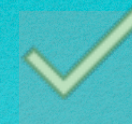
1. *Identify customer pains*
2. *Prototype quickly*
3. *Address user needs*
4. *Market the design benefits*
5. *Understand target marketing*



Variations

1. **Design product/service to help student's life in the dorm.**
This variation opens up more design possibilities.
2. **Split the teams into two groups. One group designs student desks while the other designs faculty desks.** After the competitions, discuss the difference in the user needs.

Space Launcher



Curiosity



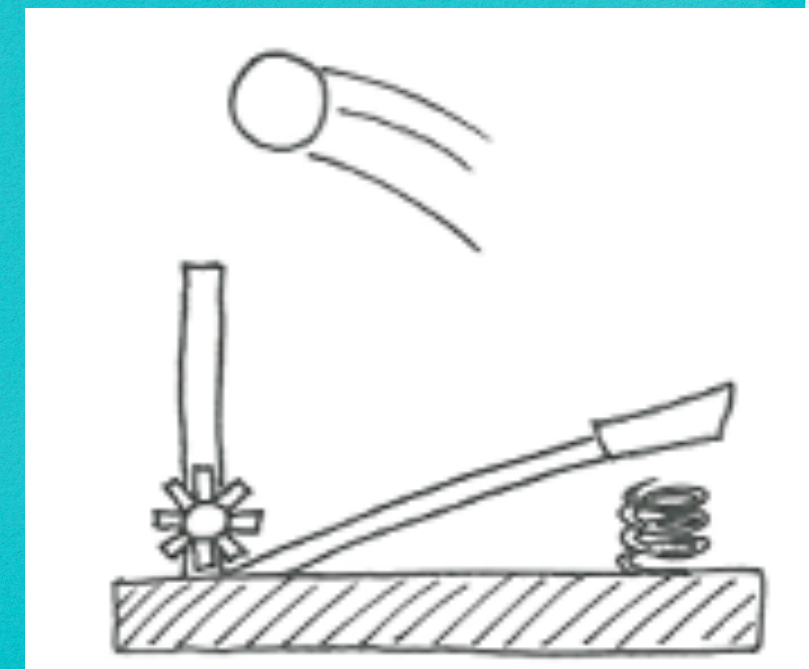
Connections



Creating Value

14

Build a device to launch ping-pong balls through a suspended ring



Space Launcher Challenge

The Challenge

Build a space launcher that fires ping pong balls through a suspended hoop. The team fires the *maximum* number of ping pong balls through the hoop wins.

The launching device should not cross the start line.

Use as much or as little of the materials provided.

Each team gets to shoot ten ping pong balls.

Time limit: 50 minutes to design, build, test, and tweak the space launcher.

Team Supplies

elastic bands, duct tape,
assorted wood dowels,
assorted popsicle sticks,
string, rubber bands, balloons,
scissors, scotch tape, masking
tape

Facilitator Supplies

hoop

method for suspending the hoop in
the air

stopwatch



1 of 16

Facilitator Tips

For a hoop, any ring will work. The diameter of the hoop determines difficulty. Hula hoop is recommended.

Mark a start line approximately three feet away from the closest edge of the hoop.

Provide different sizes of elastic and rubber bands.



Learning Outcomes

Trial and error, and learning from failure are the values at the heart of the space launcher challenge. Unlimited supplies encourages design variety. The ability to tweak the design to meet the requirements is fundamental to the challenge.

Lessons:

- 1. Prototype quickly*
- 2. Tweak the design to meet requirements*
- 3. Consistent performance*



Variations

- 1. Use a target area on the ground with different points based on where the ping pong ball lands.**
- 2. Place the hoop vertically (perpendicular to the ground) to make the competition easier.**

Incorporating Best Practices



Curiosity



Connections



Creating Value

15

Bring a global best sustainability practice to a local level



Incorporating Best Practices

The Challenge

Incorporate a global best practice for environmental sustainability locally - changing the attitudes and behavior at the grassroots level. Judges select the winning poster based on the feasibility and its potential impact.

Use one or more of the best global practices from the list provided or from your own knowledge.

Select a global best practice and find an innovative way to implement locally.

Create a poster to pitch your vision and implementation details.

Time limit: 50 minute

Team Supplies

poster, markers, pencils, ruler,
scissors, paper.

list the global best practices

Facilitator Supplies

stopwatch



Facilitator Tips

Provide a sheet listing the global best sustainable practices. Potential website for finding some facts is:

<http://epi.yale.edu/epi2012/casestudies>

A variety of countries and a diversity of the practices fosters more creative idea generation.

Participants can identify a practice that they are familiar with outside the list provided.



Learning Outcomes

The mantra for the challenge is to “Think Globally, Act Locally.” The competition forces participants to think about how to make a typical consumer be sustainable. Participants must consider how to incentivize consumers to change behavior.

Lessons:

- 1. Adopt and implement best practices.*
- 2. Understand the challenges in changing the mindset of customers.*
- 3. Increase the awareness of global sustainable issues.*
- 4. Expose to lateral benchmarking.*



Variations

- 1. Pitch using the poster to the judges.**
- 2. Pitch a sustainable practice for the campus.**

Supply Drop Challenge



Curiosity



Connections



Creating Value

16

Protect two glass candle holders from a two-story drop.



Supply Drop Challenge

The Challenge

Design the case interior to protect two fragile supplies (candle holders) when the case is dropped from 20 ft.

Buy your materials.

The winner is one who has the two fragile supplies in tact. In the case of a tie, the team that spends the least amount of money wins.

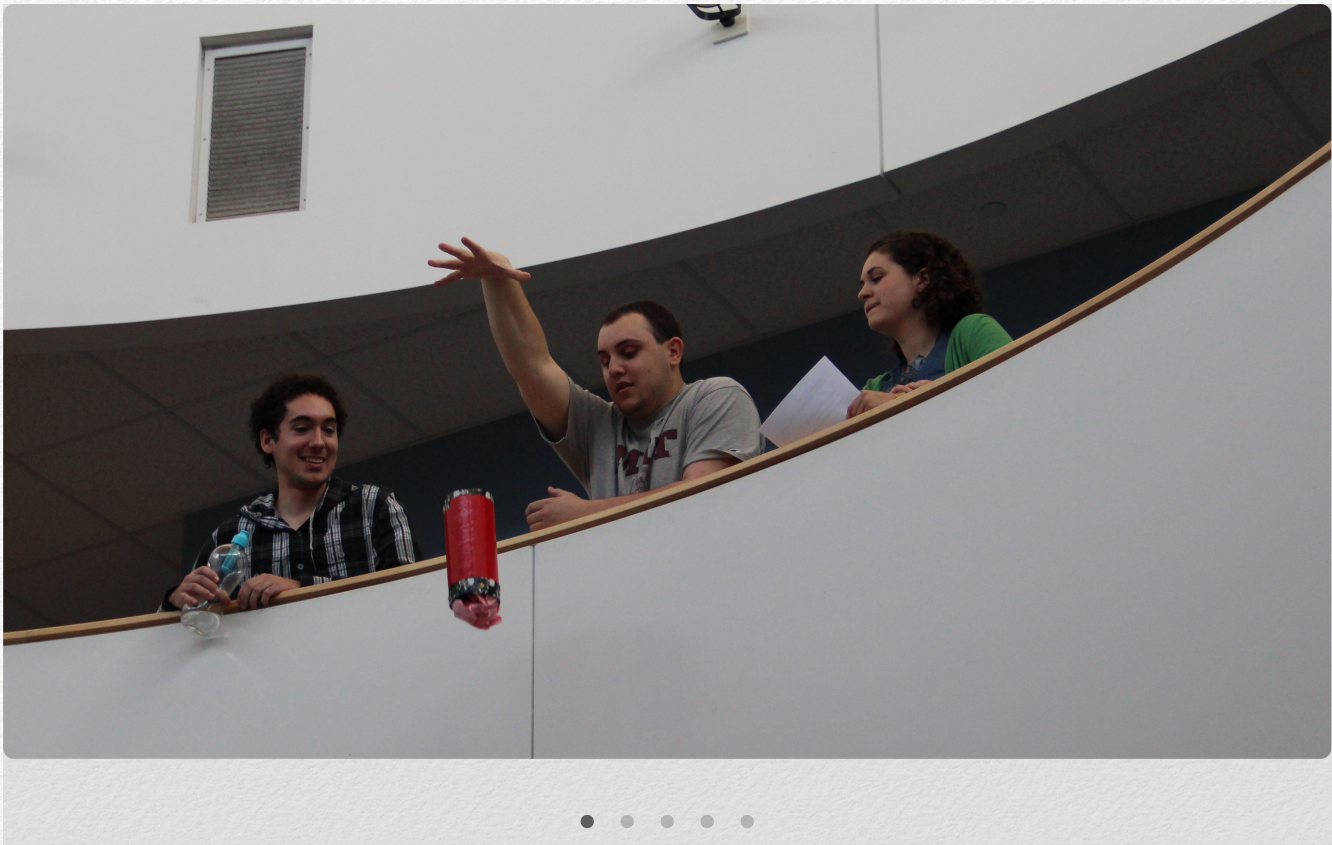
Time limit: 50 minutes

Team Supplies

iNotes
2 glass candle holders
cardboard cylinder

Facilitator Supplies

(for purchase by participants)
saran wrap, foil sheets, card stock
paper sheets, straws, duct tape.
stopwatch



Facilitator Tips

Assign higher costs for things that are likely to be more essential.

Exercise caution while opening the dropped cases. The broken glass is a potential hazard. Have a trash can to dispose off broken glass.

Before opening, display the dropped cases from the most expensive to the cheapest. Then, open the case one at a time starting with the most expensive.



Learning Outcomes

Initially, this challenge resembles an egg drop challenge. The challenge uses multiple fragile items in tight space constraint. Further, the participants have to think about financial considerations.

Lessons:

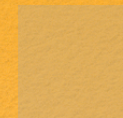
1. *Build to cost*
2. *Balance functional and financial requirements.*
3. *Identify strategies to reduce impact based on the financial constraints.*



Variations

1. Use eggs for the glass candle holders.
2. Provide unlimited supply and increase drop height.
3. Launch the case instead of dropping.

Toaster Box Design



Curiosity



Connections



Creating Value

17

Design an appealing packaging for a toaster to a “green” shopper



Toaster Box Design Challenge

The Challenge

Design a package for any toaster design from <http://www.toxel.com/tech/2010/01/01/10-innovative-toaster-designs/>

Judges (Green customers) select the winner based on which product package helps them to make the purchase decision.

Highlight the sustainable and green features of the toaster.

Time limit: 50 minutes

Team Supplies

paper/cardboard box, colored paper, pencils, markers, rulers, scissors, duct tape, masking tape, scotch tape

Facilitator Supplies

stopwatch



Facilitator Tips

Provide same size box to all participants.

Participants may customize/modify the box.

Learning Outcomes

This challenge is useful to make participants think about how the customer views the product on a store-shelf. Participants learn how the logo, tag-lines, benefits, features, color scheme and other details help to attract, educate, and aid in the final purchase decision.

Lessons:

1. *Market the product*
2. *Sell the benefits not just the features*
3. *Think like the customer*



Variations

1. Provide different size boxes and let participants choose the box.
2. Substitute toaster with another innovative product.

Gmail Improvement



Curiosity



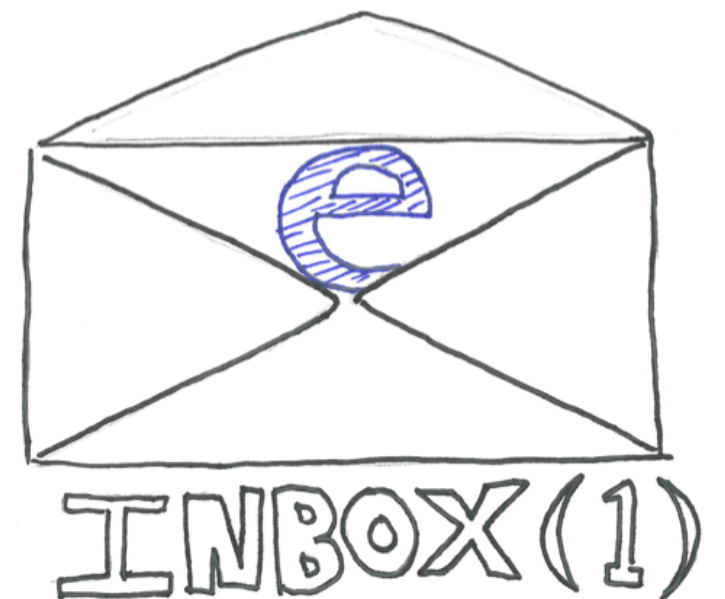
Connections



Creating Value

18

Pitch improvements to Gmail



Gmail Improvement Challenge

The Challenge

Prepare a poster and a 90 second pitch on what you would do to make gmail better. The winner will be decided by a panel of judges based on innovation and usability.

Time limit: 50 minutes

Team Supplies

poster, markers, scissors,
ruler, pencils

Facilitator Supplies

stopwatch



Facilitator Tips

Gmail was chosen as the topic to be improved because this was right before gmail released their new user interface. This allowed for a good debrief in that the participants were able to see what improvements they made and compare.



Learning Outcomes

This challenge drives home the importance of designing for the user experience. Gmail is used so widely and daily that even the smallest design features that improve the user experience matter. The better experience the user has with your product the more it will be used.

Lessons:

- 1. Designing for the user*
- 2. Clear and Concise Communication*
- 3. Taking old products and improving upon them*



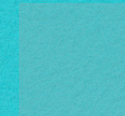
Variations

Gmail was chosen due to all participants familiarity with it, and due to how it is used daily. It is best if the subject for this competition is something that is just being improved upon to offer a quality debrief after the challenge.

Refuse Bird Feeder



Curiosity



Connections



Creating Value

19

Build an aesthetic bird feeder from trash materials



Refuse Bird Feeder Challenge

The Challenge

Design and build a bird feeder out of the trash provided. The winner is chosen based what judges like to have put up in their backyard.

Time limit: 50 minutes

Team Supplies

Empty 2 liter soda bottles,
empty soda cans, paper trash,
used packaging materials,
scissors, scotch tape, duct
tape, masking tape

Facilitator Supplies

stopwatch



Facilitator Tips

Ask participants to exercise caution while cutting the bottles or cans.

Clean the trash before the challenge. Soda residue in the bottles and cans will get messy.

Use only trash. Using only trash encourages reuse and helps the participant re-think the value of trashed items.



Learning Outcomes

The challenge promotes new uses for old objects that may end-up in a landfill. It encourages reuse part of sustainability practices. Participants should consider the functionality of the feeder for the bird, the ability to restock the feeder, and aesthetics.

Lessons:

- 1. Create value from discarded items.*
- 2. Experience sustainable practices - reuse.*
- 3. Prototype with readily available material.*



Variations

- 1. Encourage reuse by challenging participants to design other items such as toys for kids.**
- 2. Require participants to find the material (trash) during the challenge time.**

Puzzle Race



Curiosity



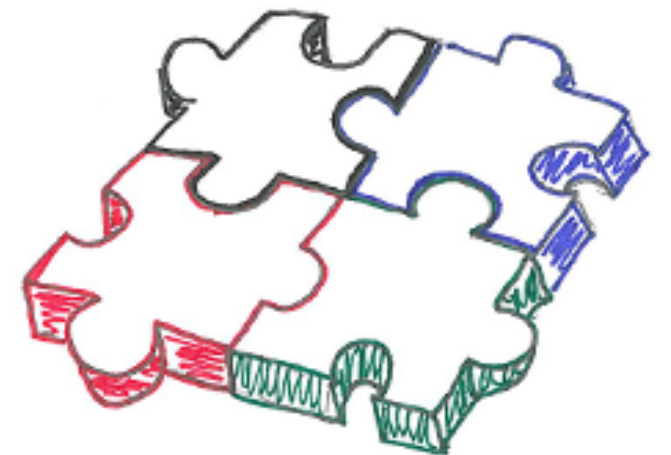
Connections



Creating Value

200

Complete a given set of puzzles.
The fastest team wins.



Puzzle Race

The Challenge

Complete the puzzles provided in order.

The team that completes the puzzles in the *shortest* time wins.

Time limit: 50 minutes

Team Supplies

a sheet of 12 puzzles/ brain teasers and the supplies needed to run them.

Facilitator Supplies

stopwatch



Facilitator Tips

- The puzzles should increase in difficulty
- Give physical objects or props mentioned in the puzzle (for example match sticks) to encourage kinesthetic learning.
- Resources such as books like M. Gardner’s The Colossal Book of Short Puzzles and Problems will help in finding good puzzles.



Learning Outcomes

Puzzles encourage creative thinking by breaking the traditional thought process. Participants develop the abilities to creative solve problems.

Lessons:

1. *Teach the value of persistence.*
2. *Think differently.*



Variations

1. Assign points to each stage. The top three at each stage get 100, 50 and 25 points. The team with most points at the end of the competition wins.
2. Provide all the puzzles at one time. The first team that completes the puzzles correctly wins.

Code Transmission



Curiosity



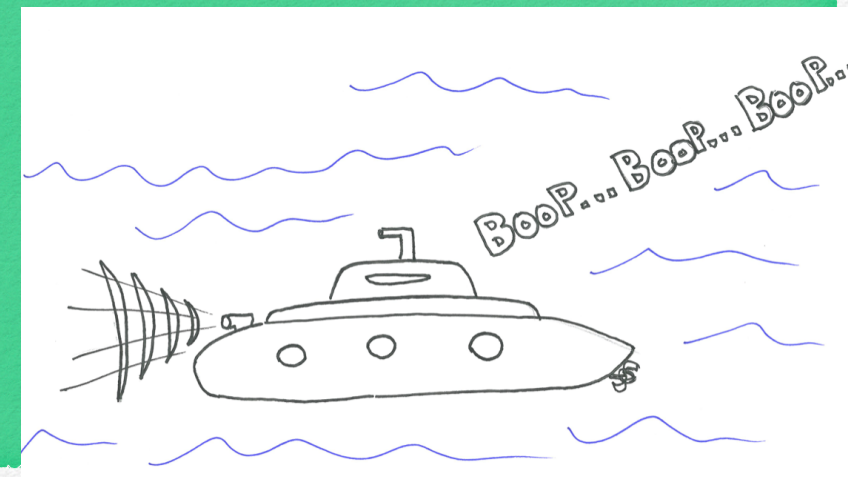
Connections



Creating Value

21

Develop a code that can securely relay a message across a 20 ft. gap.



Code Transmission Challenge

The Challenge

Create an encryption scheme to transmit a secure message across 20 ft. The team with the most accurate message wins. In the event of a tie, the fastest team wins.

If the facilitator or competitor deciphers the message, you are disqualified.

While one team member relays the secure message, the other two members decrypt it.

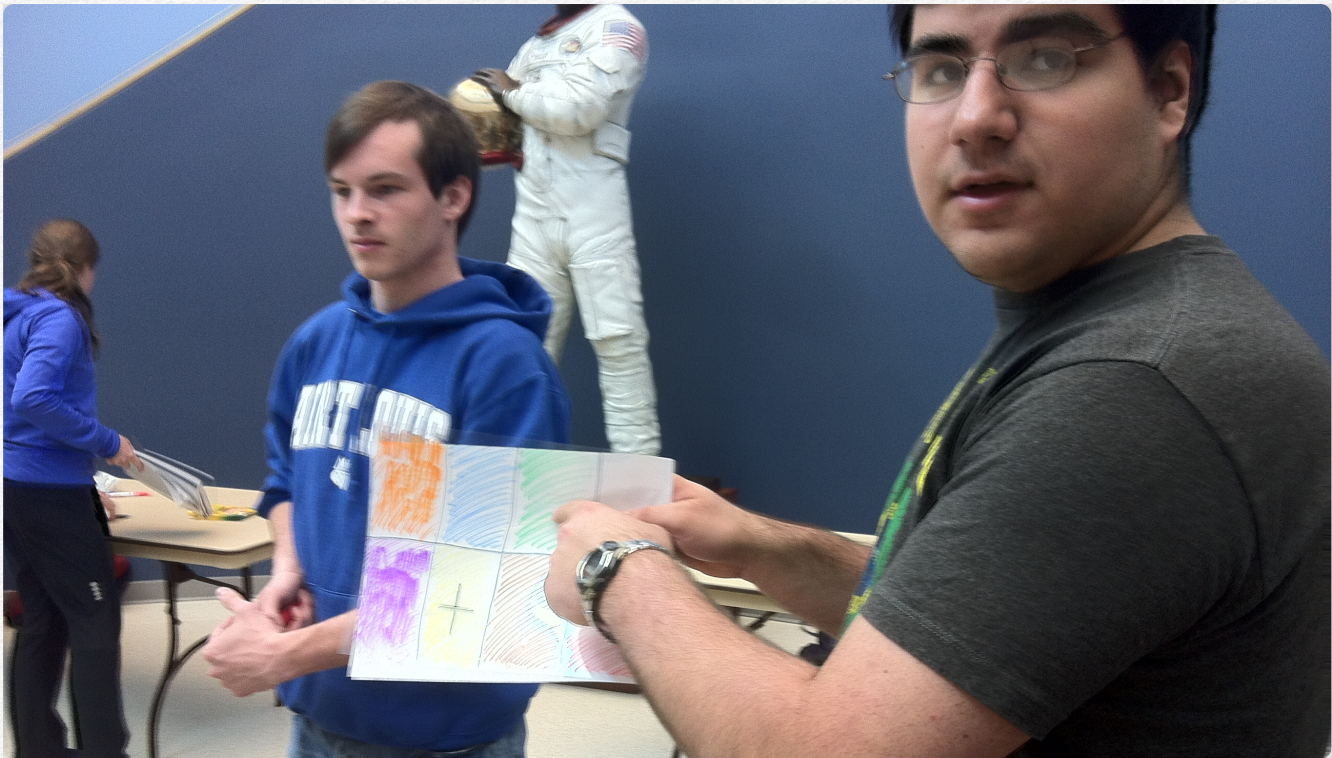
Time Limit: 30 minutes to create the encryption scheme, 20 minutes to transmit and decrypt the secure message.

Team Supplies

paper, colored pencils, markers, transparency paper, card stock paper, flashlights, bandannas

Facilitator Supplies

stopwatch
secret messages to transmit



Facilitator Tips

Disqualify teams with easy to decrypt messages and make sure the teams are aware of the rule.

Provide different secret messages to the teams after you divide the teams at 30 minutes point.

Make different messages with the same amount of letters and numbers.

Check-in the teams when they turn in the secure decrypted message so that the winner can be correctly identified.



Learning Outcomes

Participants may view themselves as spies - a fun theme. They are challenged to use unconventional means of communication. While the planning time is same for everyone, the accuracy and speed while decrypting is rewarded.

Lessons:

- 1. Create an executable plan which accounts for all the details.*
- 2. Trust the team*
- 3. Emphasize mutual dependency.*



Variation

All participants submit videos of their encoded message. The teams view all encoded messages overnight. One point is awarded to each team that breaks a encoded message of a competitor. Two points are awarded to each team whose code is unbroken. The team with most points wins.

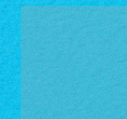
Rubber Band Car Challenge



Curiosity



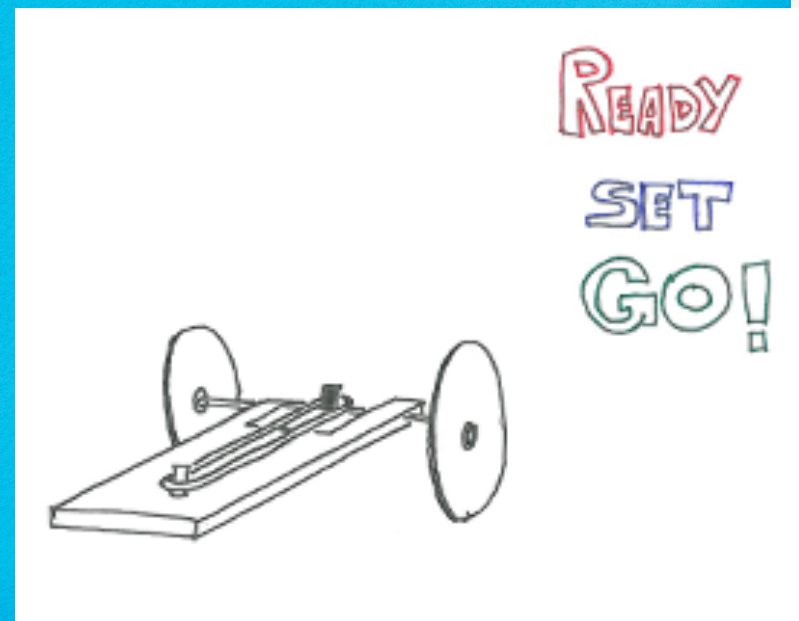
Connections



Creating Value

22

Build a car powered by a rubber band to travel the farthest distance



Rubber Band Car Challenge

The Challenge

Build a rubber band car. The car that travels the *longest* distance wins.

The car must travel on the ground i.e., its wheels must roll.

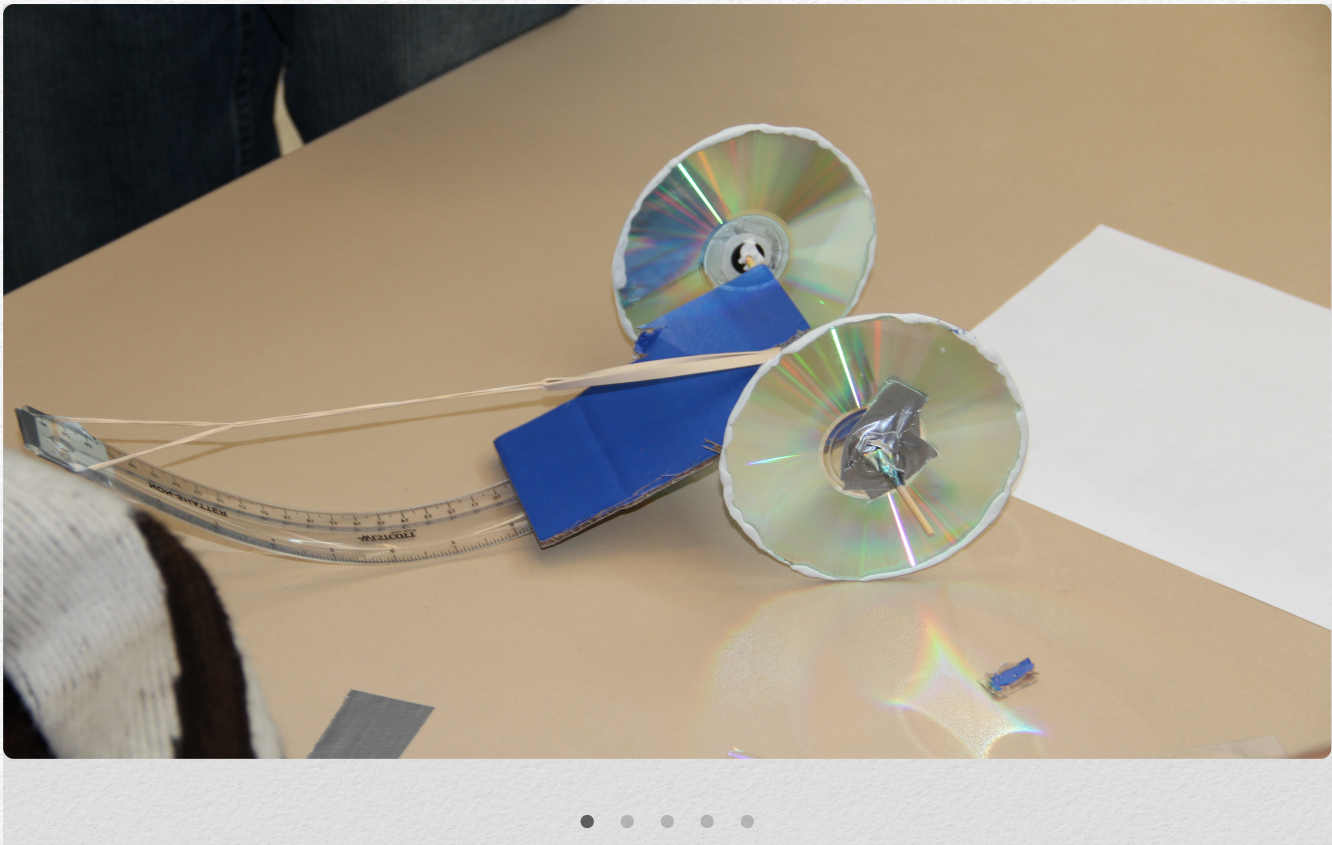
Time limit: 50 minutes to design and build

Team Supplies

2 cds, 1 cardboard square, putty, duct tape, rubber bands, a skewer, scissors, a ruler, 2 faucet washers

Facilitator Supplies

long tape measure
stopwatch



Facilitator Tips

Make sure that the car stays on the ground. A team can launch their car like a slingshot as long as the car rolls.

The team may use less material to reduce the weight.



Learning Outcomes

The rubber band car challenge brings the natural enthusiasm associated with racing. The challenge forces the participants to think of novel ways of using elastic energy.

Lessons:

1. *Prototype quickly*
2. *Break associative barriers to discover how to use elastic energy. For instance, the power source need not be on the car.*



Variations

1. **Require participants to reach a target zone with different points based on where the car stops.**
2. **Require participants to design a car that travels certain distance. The winner is one who creates the lowest cost car. Use iNotes to buy supplies.**

Foil Boats



Curiosity



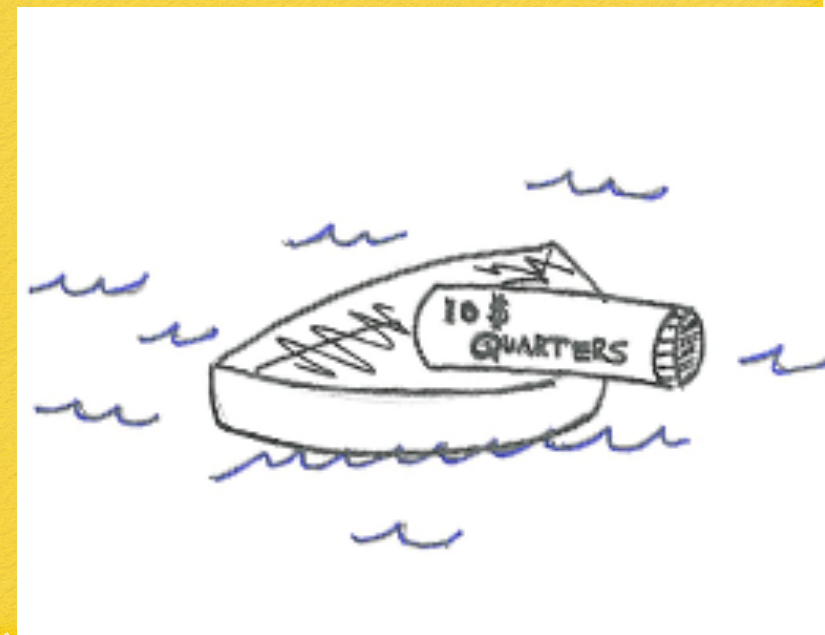
Connections



Creating Value

23

Create a boat to float the most quarters



Foil Boats

The Challenge

Fabricate a boat using the aluminum foil provided to float the *maximum* number of quarters.

The quarters should not get wet.

Time limit: 50 minutes

Team Supplies

3” by 3” sheet of foil

Facilitator Supplies

15 quarters

6 dimes

stopwatch

container full of water to float boats



Facilitator Tips

In case of a tie, use dimes for a tie breaker.

Allow participants to preload the boats or load while the boat is floating.

Allow participants to test throughout the competition.



Learning Outcomes

The foil challenge captures several aspects of innovative product design. Participants face the technical challenge of creating a stiff structure from a thin foil. Maximizing the weight a boat carries creates a greater value for the given raw material (sheet of foil). Participants learn the value of distributing the load evenly to avoid tipping. In the larger picture, it represents the need for considering the down-stream product use details during the design phase.

Lessons:

1. *Identify critical parameters (tipping and stiffness).*
2. *Prototype and test continuously.*



Variation

Create a sail boat with the foil. Add straws and saran wrap in the material supply. The sail boat must carry a certain number of quarters without getting quarters wet and travel 3 ft. in the *shortest* time.

Acknowledgements

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