Earthquake Design Challenge

Summary:
In this activity, students will draw upon recent and/or memorable earthquake activity and how structures withstood the impact of the earthquake. This lesson is two-part: 1) an introductory exploration of three small-scale structures and 2) a more detailed investigation of a larger structure. First, teams of students are asked to investigate different land movements on three types of structures in a construct, test, observe, analyze, re-test format.

For the second part, students learn that buildings in earthquake-prone areas need special consideration during the planning, design, and construction phases so they are as safe as possible as well as economically feasible. Using building codes as a guide, city planners and zoning boards work together with architects, engineers, construction companies, and financial experts in this process.

Teams of students will simulate this system by researching, designing, and building a structure out of uncooked spaghetti and modeling clay (or small marshmallows). Then, the model's structural soundness will be tested on a skateboard to simulate an earthquake. Each team will present its idea and results to the "zoning board"—you and fellow teams. One team will be awarded the contract to move forward—that is, the team with the best results will be able to display its structure in a place of honor, such as the library, showcase, or front of the class.

Estimated Duration:
Allow two to three weeks for the project, particularly in part two of the lesson where students are given time to research, create, design, test, and present the structures.

Teacher Background:
To relate this activity to real life, you may wish to explain what building codes and zoning boards are and how they function. A zoning board, also called a planning commission, consists of members hired by a city or region to plan for an area's growth and development. They are able to approve or deny the location, construction, and character of all public spaces, buildings, and structures.

The following articles give insight to current technology being used to make safe and strong structures:

- Japanese Structure Withstands Earthquake Test
  http://www.npr.org/templates/story/story.php?storyId=106611639
- Engineers design self-righting buildings that survive earthquake test in style
  http://news.stanford.edu/news/2009/august31/quake-shaking-design-090109.html

- Earthquake Test: Building Better Homes
  Improving Structural Engineering with Earthquake Simulator
  http://www.sciencedaily.com/videos/2007/0112-earthquake_test_building_better_homes.htm

There are different ways to simulate an earthquake to examine the sturdiness of the students' models. This activity uses a skateboard because it is easily found and requires no assembly. To make the testing more quantifiable, an accelerometer can be attached to the skateboard as well as on the top of the structure to give different types of data. Small, inexpensive accelerometers and an analog-to-digital interface for the accelerometers are available from vendors of "probeware." You also can check with a local high school or college physics department that might have similar equipment that can be borrowed.

Pre-Assessment:
Use the pre-assessment to determine students' prior knowledge of the following:

- earthquakes and known damage that can result
- earthquake causes
- predicting earthquakes
- preventing earthquakes
- reasons for varied earthquake damage
- ways to keep people safe

Student responses will help you determine what the students may already know and how much time to spend on specific areas of content (Attachment A).

Scoring Guidelines:
For summative assessment, and the source for the student's grade on the project, see the Post-Assessment (Attachments A-1 and A-2), the Post-Assessment Presentation Rubric (Attachment E), and the Post-Assessment Structure Rubric (Attachment F).

For formative assessment, or to gather information about the students' learning, see the Purchase Order Form (Attachment C) and the Business Summary Report (Attachment G). Teacher observations and discussions also can be used to monitor the students' understanding of the concepts.

Post-Assessment:
The primary Post-Assessment is the same as the Pre-Assessment (Attachment A-1). Other post-assessments include the Post-Assessment Presentation Rubric (Attachment E), Post-Assessment Structure Rubric (Attachment F), and the Business Summary Report (Attachment G).

Before You Begin:
Gather the materials below for the investigation introduction.

- copy of student handouts (Attachments B-1 and B-2)

- deck of playing cards, one per group
- 3 sheets of graph paper per group
- construction paper
- 10 drinking straws
- 10 stir sticks
- box of small paper clips
- box of large paper clips
- 1 metric ruler
- 1 tape measure
- box of 12 new pencils
- piece of cardboard large enough to hold the structure
- masking or transparent tape
- large hardback textbook or dictionary
- incline plane strong enough and wide enough to support the textbook or dictionary and structure
  (example, a wood board 1–3 ft L x 6 in. W x 1 in. H)
- chair to sport the incline plane
- watch or clock with second hand
- one 16-oz. bag of mini-marshmallows (or small balls of modeling clay if preferred)
- one 3-lb. box of regular, uncooked spaghetti
- one roll of masking tape
- scissors for the teacher
- larger paper (11×17), tag, or poster board for each group's drawing
- 4 'lead role' lanyards/tags labeled *Architect, Engineer, Project Manager, Accountant*
- sign that reads "Commercial Materials Supply Warehouse" or something similar
- 1 metric ruler
- ruler or tape measure
- uncooked eggs, 1–2 per team
- hard-cooked eggs, 1–2 per team
- a skateboard
- plastic bags or tarp for covering the floor
- handouts (see attachments)

Have these materials available for students to conduct research with:

Non-fiction books and reference books
Computers with access to the Internet to visit sites such as:

- Fault Motion Animations
  http://www.teachingboxes.org/catalog.jsp?id=DLESE-000-000-009-461
- Engineering for Earthquakes
  http://eduweb.com/portfolio/bridgetoclassroom/
- Terra Electronica: Earthquake Simulator Videos, History, and more
  http://www.allshookup.org/seismic.htm
- Live Internet Seismic Sites

http://aslwww.cr.usgs.gov/Seismic_Data/liss.htm and
http://aslwww.cr.usgs.gov/Seismic_Data/realtimesites.htm

- PhysOrg—searchable news information on many topics, including earthquakes
http://www.physorg.com/tags/quake+simulator/

Other Resources:

- The Weather Channel (check cable network for station information)
- The Weather Channel: Glossary
http://www.weather.com/glossary
- Can We Predict Earthquakes?
http://www.usgs.gov/corecast/details.asp?ID=76
- The Severity of an Earthquake
http://pubs.usgs.gov/gip/earthq4/severitygip.html
- Earthquake Information from USGS
http://quake.wr.usgs.gov/
- Red Cross Earthquakes Awareness Message
http://www.redcross.org/images/pdfs/code/earthquakes.pdf
- TheTech-Earthquakes
www.thetech.org/exhibits_events/online/quakes/intro

Day One:

1. Before beginning the activity, allow students to take the Pre-Assessment (Attachment A-1).
2. Review the students' answers and adjust the activity accordingly.

Day Two:

Before students arrive:

1. Determine how students will be grouped.
2. Set up three investigation stations for each group of students. It may be possible to have three of each station and allow students to rotate. The order in which the students explore the stations does not matter.

After students arrive:

3. Explain that groups of students will be designing, building, and testing structures to see what will help those structures withstand an earthquake.

4. Pass out the Investigation Introduction handouts (Attachments B-1 and B-2) to each student and ask them to complete the handout during the class period.
5. In groups of three, have students rotate to each of the three Investigation Stations.
6. Upon completion, conduct a class discussion on the findings, patterns, and other things they learned based on the investigations. Record on chart paper or on the board.

7. Explain that this information will be useful as they move forward in the activity.

Day Three:

Before students arrive:

1. Secure computer access for one day and a computer for each student. You also can have students share with partners.
2. To save time, turn on the computers and launch the internet browser to http://eduweb.com/portfolio/bridgetoclassroom/. Be sure the audio is working and is at the proper volume.
3. Prepare a place to write if the room does not have one present. (For example, if the computer lab doesn't have a board, bring in large pieces of paper and tape them to the wall.)

After students arrive:

4. Start the class by asking students why earthquakes are so devastating. When they see videos or pictures, what kind of damage do they see? Record answers on the board or on chart paper.
5. Help students understand that various factors contribute to the failure of a structure during an earthquake. Ask them to recall from the introductory investigation what contributed to greater damage: amount of shaking/ground movement or construction of the structure.
6. Share that they are going to be doing a computer simulation, testing the ability of different types of bridge construction to survive a major earthquake.
7. Have students write down the possible causes for the structural failures.
8. Refer students to Engineering for Earthquakes at http://eduweb.com/portfolio/bridgetoclassroom/ and supervise their exploration of the internet activity.

   Instructional Note: Students should see that the same structure reacts differently to different earthquakes. Knowing the stability of the land is helpful when building structures; the more structurally sound the building needs to be, the more expensive the project will be.

Days Four and Five:

1. Now that students have had hands-on exposure to structural soundness on a small scale, explain that they will now work in their teams to design, build, present, and test a larger structure in front of the class and the "zoning board" (you). And, like in real life, they need to keep the costs as low as possible without jeopardizing safety.
2. Share that the goal is to use no more than $5,000 to build the tallest possible structure. It should be 35 cm tall minimum, built in a specific space (maximum width and length of the skateboard) that will withstand

an earthquake and still keep people (represented by an uncooked egg on top of structure) safe for at least 10 seconds.

3. Ask students what a zoning board is. Help them understand various aspects of the zoning board including codes, and so on. (See Teacher Background.)
4. Allow time for students to use the Internet and library to research past failures and successes in the area of "quake-safe" buildings. Notes should be recorded on the Research Log (Attachment J).
5. After the research, have teams select which members will be in charge of the following tasks:
    - Architect: in charge of drawing the structural blueprint/design
    - Accountant: in charge of the budget by tracking how much money is being spent on supplies and how much money remains
    - Project manager: in charge of determining materials, what is needed, quantities, and getting the materials
    - Engineer: in charge of the structural strength and safety of the structure and problem-solving to make it better
6. The team should then come up with a company name.
7. Students should turn in a piece of paper listing the team's company name and the roles of each student. All members of the team will have input and assist the leaders, and all members will be building the model.
8. Explain that students should be thinking of design ideas.

Day Six:

1. Upon arrival, students should be reminded of their different lead roles and indicate this with lanyards/tags. For example, if Jared is serving as the architect, he would wear the *Architect* lanyard/tag. (See Attachment I.)
2. Students work with their team using their research and introductory activity—a design that will help reach the goal as described in number 2 in Days 4 and 5.
3. The architect will be in charge of the final draft submitted to the zoning board (teacher).
4. Supervise students and move from group to group to facilitate and monitor progress.
5. Once the blueprints are approved, the supply warehouse can open. Hang the sign that reads *Supply Warehouse*.
6. Show the materials to the students. Passing out samples as a marketing tool to draw in more business will allow students to become more familiar with the materials. Materials and their costs are as follows:

Material	Cost
Spaghetti	$100.00/stick
Mini-marshmallow	$50.00/marshmallow

1-in. masking tape $25.00/2.5 centimeters

7. Teams can move into the next phase of determining how they can use the materials to achieve the goal.
8. The project manager uses the Purchase Order Form (Attachment C) to buy the materials from the Supply Warehouse. The transaction is only possible if the accountant has given the project manager a company check (Attachment H). Again, the total budget for all materials is $5,000. The store owner (teacher) can use the Statement of Transaction Form (Attachment D) to keep track of each team's spending.

Days Seven and Eight:

1. Teams should continue working in their lead roles and in support of each other to build their model.
2. Monitor the students' work and invite each team to test their design on the skateboard. You should be the one to maneuver the skateboard. A recommended testing procedure is to lay the ruler or tape measure on the floor beside the skateboard. Then, have the team place the structure on the skateboard and then move the skateboard back and forth three times at a distance of no more than 30 centimeters.

   Instructional note: The subjective component is the speed at which the skateboard is moved. It should be the goal to be as consistent as possible for each test.

3. Allow students to test their structure with an egg in place—hard-cooked eggs work well for testing situations—saving the uncooked eggs for the final competition.
4. Encourage teams to alter and re-design after each test. The Post-Assessment Structure Rubric (Attachment F) should be used as a guide.

Day Nine:

1. After the structures have been designed, built, and tested, teams should prepare a presentation to the "zoning board" (teacher) and competing companies (teams of classmates).
2. Ask students to examine the Post-Assessment Presentation Rubric (Attachment E) and use it as their guide for the presentation.
3. The class time should be used by the groups to prepare for the presentation the next day and put final touches on their structures.

Days Ten and Eleven:

1. Teams present to the class based on elements in the Post-Assessment Presentation Rubric (Attachment E).
2. Students in the audience are encouraged to listen actively and ask questions.

3. After each team presents, the structure is tested using the same procedure used on days 7 and 8. However, an uncooked egg positioned by the team should be used for the final test. See Post-Assessment Structure Rubric (Attachment F).
4. Have the students fill out and submit the Business Summary Report (Attachment G) to summarize what worked and what they would change in both the presentation and the structure.
5. Draw conclusions regarding what buildings need to be as safe from earthquakes as possible and how economics plays a part.
6. Celebrate each team's success.

Instructional Note: Place plastic tarp or bags on the floor during test days for easy egg clean up.

Differentiated Instruction:

- Instructions for the Introductory Investigation can be modified to allow for more inquiry based on time, student interest, and student ability.
- Cooperative learning groups can be based on student interest (for example, students who wish to make a certain building type are in one group) or as homogenous or heterogeneous ability groups.
- Multiple learning styles are addressed—such as verbal and visual, and intra- and inter-personal dynamics are used.
- Bloom's Taxonomy Levels (Knowledge, Comprehension, Application, Analysis, Evaluation, and Synthesis) are represented thoughout the lesson and can be weighted more heavily, depending on the student.

Extensions:

Encourage students to do the following:

- Showcase the winning model at a local city planning or zoning board meeting.
- Contact a local building inspector or zoning board member and find out what the building codes are in your area and why they exist.
- Create an advertisement for print, radio, or television media about your team's building plan, highlighting the special "quake safe" features you have used.
- Research the lead roles taken during the activity and then write or email someone that holds one of these positions. Discuss his/her field, how he/she would design a similar project in real life, and/or invite him/her to be a guest speaker at school.

- Research earthquakes—even small ones you may not feel—near where you live, where family or friends live, or even globally, to find the top three strongest earthquakes in the area historically. What might explain the location of those earthquakes?

- Earthquakes have been featured in movies, songs, and even amusement park attractions. Have students select an example and list and examine the reason for the earthquake reference and the accuracy of the earthquake as described in the example.

Home Connections:

- Ask your family how they would prepare for an earthquake. What precautions could be put into place in the event that gas lines, water lines, or structural damage occurs to the home? Work to make a plan of action to keep all members of the family, including pets, safe in the event of an earthquake or other natural disaster.

- After seeing videos or pictures of earthquakes, such as the ones in Haiti or Chile in 2010, discuss with your family what you feel about lessons that can be learned from such events.

STEM Connections:
Science: inquiry, discovery, and experimentation; geology content material, research, science-related careers

Technology/Engineering: planning, creating, designing, constructing, and testing the bridges and towers; use of the Internet, calculators, and software programs

Mathematics: general computation and analysis of numerical data, finance, taking measurements of all dimensions and weight

Career Opportunities:

- Structural Engineers

- Civil Engineers
- Materials Engineers
- Mining Engineers
- Safety Engineers
- City Planners
- Zoning Board/Planning Commission members
- Computer Simulation Designers and Programmers
- Drafters
- Engineering Technicians
- Architects
- Mathematicians

Attachments:
Attachment A-1: Pre-/Post-Assessment
Attachment A-2: Pre-/Post-Assessment Possible Responses
Attachment B-1: Investigation Introduction: Build and Test
Attachment B-2: Investigation Introduction: Data Collection and Analysis
Attachment C: Purchase Order Form

Attachment A-1
Pre and Post Assessment

Name: _______________________________ Date: ________________

1. What earthquakes, if any, are you familiar with and what kind of damage did you see or learn about in the news?

2. What causes earthquakes?

3. Can earthquakes be predicted? Why or why not?

4. Can earthquakes be prevented? If so, in what way?

5. Why might some earthquakes result in more damage while others result in less damage?

Attachment A-2
Pre-/Post-Assessment Possible Responses

1. What earthquakes, if any, are you familiar with and what kind of damage did you see or learn about in the news?

[Possible Answers: will vary though may include the well-documented Haitian earthquake of January 12, 2010, or the February 27, 2010 earthquake in Chile.]

2. What causes earthquakes?

[Possible Answers: should include some information on the slow movements inside Earth that push against Earth's outer layer, causing stress and fracturing of the rocks. Earth's outer layer is composed of many moving plates, the boundaries of which are the sites for most earthquakes.]

3. Can earthquakes be predicted? Why or why not?

[Possible Answers: Scientists cannot exactly predict earthquakes, but they can look for patterns and determine when and where an earthquake might happen, how large it may be, and what areas to avoid when constructing roads and buildings.]

For more information, visit
Can We Predict Earthquakes?
http://www.usgs.gov/corecast/details.asp?ID=76.

4. Can earthquakes be prevented? If so, in what way?

[Possible Answers: No, not with current technology. However, there are experiments looking at this issue.] .

5. Why might some earthquakes result in more damage while others result in less damage?

[Possible Answers: Structural soundness of buildings, population density, and intensity and magnitude of the earthquake are factors that determine how much damage will occur.]

For more, visit The Severity of an Earthquake http://pubs.usgs.gov/gip/earthq4/severitygip.html and Red Cross Earthquakes Awareness Message http://www.redcross.org/images/pdfs/code/earthquakes.pdf.

Attachment B-1

Investigation Introduction: Build and Test

Name: ________________________________

Team Members: ____

Directions: As a team, visit each of the three build/test stations and use the materials below to construct a building at least 25 cm tall that passes each of the three tests presented below. Record your observations, results, and analysis on the next sheet.

Materials:

- Attachment B-2
- deck of playing cards, one per group
- 3 sheets of graph paper per group
- construction paper
- 10 drinking straws
- 10 stir sticks
- box of small paper clips
- box of large paper clips
- 1 metric ruler
- 1 tape measure
- box of 12 new pencils
- piece of cardboard large enough to hold the structure
- masking or transparent tape
- large, hardback textbook or dictionary
- incline plane strong enough and wide enough to support the textbook or dictionary and structure
  (example, a wood board l–3 ft L x 6 in. W x 1 in. H)
- chair to sport the incline plane
- watch or clock with second hand

Investigation at Station #1: Surface Impact
Design a structure that will remain standing even when the heavy book is dropped onto the floor next to the structure. The book should be dropped at twice

the height of the structure and land as close to the structure as possible without actually touching it.

Test:

1. Using the graph paper as the base, build a structure at least 25 cm tall.
2. After building it, record the height measurement on the handout.
3. Once complete, draw around the base of the structure you built leaving an outline on the graph paper.
4. Do not attach the building to the graph paper.
5. Drop a heavy book onto the floor directly next to the structure.
6. Repeat for a total of three drops.
7. Afterwards, draw the new outline of the base of the structure.
8. How much did the base move? Did any items fall off the structure? If so, how far away from the structure did they land? Record information on the handout.

Investigation at Station #2: Incline Impact
Design a structure that will remain standing even when the heavy book is dropped onto the top of the incline plane that holds the structure. The book should be dropped from twice the height of the structure and land as close to the top of the incline plane as possible.

Test:

1. Tape the graph paper on the incline plane about 15 cm from the bottom of the incline plane.
2. Using the graph paper as the base, build a structure at least 25 cm tall and build it on the incline plane.
3. Do not attach the building to the graph paper or incline plane.
4. After building, record the height measurement on the handout.
5. Once complete, draw around the base of the structure you built leaving an outline on the graph paper.
6. Drop the heavy book on the “top” end of the incline plane.
7. Repeat for a total of three drops of the book on the incline plane.
8. Afterwards, draw the new outline of the base of the structure.
9. How much did the base move? Did any items fall off the structure? If so, how far away from the structure did they land? Record information on the handout.

Investigation at Station #3: Below Ground Impact
Design a structure that will remain standing even when the structure is on unstable ground. The structure will be tested on a bed of rolling pencils which will be moved back and forth three times, 15 cm each way.

Test:

1. Tape the graph paper on a piece of cardboard.
2. Using the graph paper as the base, build a structure at least 25 cm tall and build it on the cardboard.
3. Do not attach the building to the graph paper or cardboard.
4. After building, record the height measurement on the handout.
5. Once complete, draw around the base of the structure you built, leaving an outline on the graph paper.
6. Place 12 new pencils side by side, length-wise on a flat surface.
7. Place the cardboard base/structure on a bed of pencils.
8. Roll the cardboard base/structure back and forth for a distance of 15 cm each way, one roll per second, for a total of 3 “back and forth” movements in 3 seconds.
9. Repeat step 8 two more times.
10. Afterward, draw the new outline of the base of the structure.
11. How much did the base move? Did any items fall off the structure? If so, how far away from the structure did they land? Record information on the handout.

Attachment B-2

Investigation Introduction: Data Collection and Analysis

Name: ________________________________

Team Members: ____

As a team, visit each of the three build/test stations. If your team has time at any of the three stations, rebuild the structures with the changes and record.

	Investigation for Station 1 Height: _____cm	Investigation for Station 2 Height: _____cm	Investigation for Station 3 Height: _____cm
Describe what was built including the materials used.			
How was the structure affected by the test? Include any measurable data.			
Why do you think the building reacted the way it did?			
What are your team's recommendations if the structure were to be built again to be more structurally sound?			
Other information or re-test info:			

Attachment C

Purchase Order Form

Team Company Name:

____

Date: ________________

Purchase order number: _________

Bill To:

____

(Accountant's Name)

Ship To:

____

(Project Manager's Name)

Quantity	Description	Unit Price	Total
Comments:		Subtotal	
		Tax (6.5 %)	
		Shipping	
		Total Payment	

Attachment D

Statement of Transaction Form

Company Name: ____

Date	Invoice #	Description	Units	Payment	Balance

Total ___________

Attachment E

Post-Assessment Presentation Rubric

Student Name: ______________________________________

From: ____
(Company)

Your Lead Role(s): ___________________________________

CATEGORY	4	3	2	1
Collaboration with Peers	Almost always listens to, shares with, and supports the efforts of others in the group. Tries to keep people working well together.	Usually listens to, shares with, and supports the efforts of others in the group. Does not cause disruptions in the group.	Often listens to, shares with, and supports the efforts of others in the group but sometimes is not a good team member.	Rarely listens to, shares with, and supports the efforts of others in the group. Often is not a good team member.
Information Gathering with Research Log	Accurate information taken from at least three sources AND recorded on the Research Log.	Accurate information taken from two sources AND recorded on the Research Log.	Accurate information taken from one or two sources and Research Log may or may not have been used.	Inaccurate information used and Research Log not was used.
Using Research	Two or more examples of research given. Excellent description of how research applies to project.	One or two examples of research. Good description of how research applies.	One example of research given. Weak description of how research applies.	No examples of research given. Poor description of how research applies.
Speaks Clearly	Speaks clearly and distinctly all (95–100%) of the time, and mispronounces no words.	Speaks clearly and distinctly all (95–100%) of the time, but mispronounces a few words.	Speaks clearly and distinctly most (85–94%) of the time. Mispronounces several words.	Often mumbles or cannot be understood OR mispronounces more than one word.
Comprehension	Student is able to accurately answer all questions posed by classmates about the topic.	Student is able to accurately answer most questions posed by classmates about the topic.	Student is able to accurately answer a few questions posed by classmates about the topic.	Student is unable to accurately answer questions posed by classmates about the topic.

Posture and Eye Contact	Stands up straight, looks relaxed and confident. Establishes eye contact with everyone during the presentation.	Stands up straight and establishes eye contact with everyone in the room during the presentation.	Sometimes stands up straight and establishes eye contact.	Slouches and/or does not look at people during the presentation.
Volume	Volume is loud enough to be heard by all audience members throughout the presentation.	Volume is loud enough to be heard by all audience members at least 90% of the time.	Volume is loud enough to be heard by all audience members at least 80% of the time.	Volume often too soft to be heard by all audience members.

Total: ____/28
Comments:

Attachment F

Post-Assessment Structure Rubric

Student Name: ______________________________ From ______________________________
(Company)

Your Lead Role(s): ____

Base Dimensions of Structure ___________ cm x cm x cm (must fit on skateboard base)

Money Spent ___________ ($5,000 budget allowed)

Height of Structure ___________ cm (35 cm min.)

Time Recorded before Collapse ___________ sec. (10 seconds min.)

CATEGORY	4	3	2	1
Blueprints	Plan is neat with clear measurements and labeling for all components.	Plan is neat with clear measurements and labeling for most components.	Plan provides clear measurements and labeling for most components.	Plan does not show measurements clearly or is otherwise inadequately labeled.
Use of Resources	Completed task without going over budget ($5,000)	Went over budget by $200 or less.	Went over budget by $201 or more up to $500.	Went over budget by more than $500.
Height of Structure	Structure is 35 cm or more.	Structure is 30 cm tall but less than 35 cm tall.	Structure is more than 20 cm tall but less than 30 cm tall.	Structure is less than 20 cm tall.
Function, prior to final test	Supports egg easily without leaning or swaying.	Structure stands on own but leans or wobbles. Will support egg.	Structure stands but will not support egg.	Structure will not stand on own. Will not support egg.
Final Test	Egg does not fall and structure remains intact for 10 seconds.	Egg falls but structure remains intact and standing for 10 seconds.	Egg falls. Structure breaks or falls within 10 seconds.	No test/no structure. Structure so poorly built it cannot be tested.

Total: ____/20

Comments:

Attachment G

Business Summary Report

Team Company Name: ________________________________

Student Name: ________________________________

List the job(s) in which you were the lead:

What went well during your presentation?

What would you change in your presentation for next time?

Regarding your structure, what worked well?

Regarding your structure, what would you change for next time?

Attachment H

Checks

Accountant: Neatness matters in check writing. Here are some other tips:

1) Fill in your company name and address in top left corner.
2) Fill out “Pay to the Order of” with “Supply Warehouse.”
3) Write the dollar amount in numbers in the box. For example: $400.00
4) On the blank line, spell out in words the amount of the check. For example:
Four hundred dollars and ~~~~~~~~~~~~~~~~~~~~~~~~~~00/100
5) Check must be signed (not printed) to be valid.
6) Use the memo to write what the check was for (what was bought).
7) Be sure to record the transaction on the Statement of Transaction form.

______________________________ 91-758/698 Check No. 1000

____

PAY TO THE
ORDER OF ____ [ ]

____

Hometown State Bank, USA

Memo ______________________________

____

Company Accountant

0000753k57##:// 888532//; LL99654#**

______________________________ 91-758/698 Check No. 1001

____

PAY TO THE
ORDER OF ____ [ ]

____

Hometown State Bank, USA

Memo ______________________________

____

Company Accountant
0000753k57##:// 888532//; LL99654#**

91-758/698 Check No. 1002

PAY TO THE
ORDER OF

Hometown State Bank, USA

Memo

Company Accountant
0000753k57##:// 888532//; LL99654#**

Attachment I

Lead Role Badges

Engineer	Architect
Project Manager	Accountant

Attachment J

Research Log

Team Name: ____

Your name: ____

****

Name of site ____

http://____

Description ____

____

____

____

Name of site ____

http://____

Description ____

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____

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Name of site ____

http://____

Description ____

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Acknowledgements:

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Teaching & Learning Collaborative www.teachinglearningcollaborative.org