Engaged Learning Project

Title of Project: Using Trash to Build the Future
Subject(s): Science, Math, Language Arts
Grade Level(s):3
Abstract:

Students will be working in groups as engineers to solve the real word problem of recycling by reusing materials to design and build a strong and tall tower. The groups will follow design constraints and build their towers to withstand earthquakes and high wind simulations. This will encourage students to look at ways they can reuse items they would otherwise throw away. They will begin by researching landfills and how human effect the environment. During the day the students build their towers, each group with have a reporter who will be repressible for documenting progress throughout the project. Once students are finished with their towers, students will then make a commercial using iMovie, a brochure using Pages or Easelly, or a radio ad using Garageband. They will present these first to the class and then three will be chosen to present at a program our district will do in the summer for educators called Mobile Minds.

Learner Description/Context:

This project will be implemented in four Third Grade classrooms including one co-taught classroom. The students will have access to iPads during the school day. Most do not have at home access to the internet so all of the work for this project can be done at school to ensure equitable access. The students are familiar with iMovie and Pages, so the students who choose these products are more advanced with them. The students have not previously used Easelly or Garageband. The groups will be carefully selected to include students with mixed skill levels and content knowledge. Many parents in the community are not concerned with recycling or its effects on the environment. Therefore, students do not have very much previous knowledge about recycling. Learners vary greatly in this grade level by ability. They include students with IEP's as well as students who are gifted. The learners come from a variety of ethnicities as well. 45% Caucasian, 35% African American, 40% Hispanic, 5% Multi-Racial and 5% Asian.

Time Frame:

Materials for this project will have to be collected for this project starting about two weeks before the start date. This unit will take approximately 2-3 weeks. This will include time for research, development, engineering their building, and creating their presentation during their daily science time which is a 50 minute block. Students will work on the persuasion paper during Language Arts and they will work on the graphing during Math. They have a 50 minute block for Math and Language Arts, however the students will not be working on the project everyday during these times.

Standards Assessed:

S3L2. Students will recognize the effects of pollution and humans on the environment.
a. Explain the effects of pollution (such as littering) to the habitats of plants and animals.
b. Identify ways to protect the environment.
• Conservation of resources
- *Recycling of materials*

MCC.3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories.

ELACC3W1: Write opinion pieces on topics or texts, supporting a point of view with reasons.
ELACC3W4: With guidance and support from adults, produce writing in which the development and organization are appropriate to task and purpose. (Grade- specific expectations for writing types are defined in standards 1-3 above.)
ELACC3W5: With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grade 3.)
ELACC3W6: With guidance and support from adults, use technology to produce and publish writing (using keyboarding skills) as well as to interact and collaborate with others.
ELACC3W7: Conduct short research projects that build knowledge about a topic.

ELACC3W8: Recall information from experience or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

ISTE Student Standards
Creativity and innovation
Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.
a. Apply existing knowledge to generate new ideas, products, or processes
b. Create original works as a means of personal or group expression
2. Communication and collaboration
Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.

a. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media
b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats
d. Contribute to project teams to produce original works or solve problems
3. Research and information fluency
Students apply digital tools to gather, evaluate, and use information.
a. *Plan strategies to guide inquiry*
4. Critical thinking, problem solving, and decision making
Students use critical thinking skills to plan
and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
b. Plan and manage activities to develop a solution or complete a project
6. Technology operations and concepts
Students demonstrate a sound understanding
of technology concepts, systems, and operations.
a. Understand and use technology systems
b. Select and use applications effectively and productively
c. Troubleshoot systems and applications
d. Transfer current knowledge to learning of new technologies

Learner Objectives:

Students should be able to explain different methods of waste disposal. They will be able to summarize to summarize some of the major problems that waste disposal causes, and share research that shows how engineers help with waste disposal. Students should be able to describe the different steps involved in recycling. Students will have constructed a tower based on the design model they researched and should be able to describe the steps of the engineering design process. Students will evaluate the design to synthesize a solution to the problem. Students will formulate an opinion about recycling and present it orally. They will be able to identify strong arguments for their positions.

The "hook" or Introduction:

Do you ever wonder what happens to all the trash you throw away? Almost all of it ends up in landfills, which only have limited space. If we keep adding trash to landfills at our current rate, we will eventually fill up our landfills. Can you imagine what that would be like? With all the landfills full, what would we do with all our garbage? Surprisingly, a lot of the "trash" that ends up in landfills could actually be reused. Wouldn't it be great if people built homes from all the scrap pieces of metal, plastic, glass and other unwanted materials lying around? If we start using recycled garbage in buildings now, maybe we can reduce the amount of trash that ends up in landfills.

Some engineers have already started building homes and other buildings by reusing things other people would consider garbage. These engineers are continually working to find better ways to build homes and other buildings using recycled materials. Some new designs use old shipping containers for walls, collections of glass bottles for windows, and old pieces of tires as roofing material. Can anyone think of some other waste materials engineers could use in buildings? How could they be used?

(For the day we are building the buildings) Today, we will get to reuse various materials, such as cans and newspaper, to design our very own towers! We want to prove that our towers are just as strong as buildings made from conventional or typical building materials, so we will also test our towers. Each building will undergo a wind test and an earthquake test. To add more of a challenge, you will have constraints just like real engineers. For example, your tower must be at least three feet tall and be able to hold a tennis ball on top. Sounds like a challenge we all can handle!

Process:

Students will begin collecting the materials for the building part of the project approximately two weeks before the project begins. The first week will be devoted to researching and discovering information about landfills, recycling, ways to reuse materials, and the ways that materials have been used to build structures. They will also collect data inquiring if students recycle at home for the graphing aspect in math. The second week will focus on going over the requirements for the building, developing the rubric for assessment for the commercial, and refining the design concept for their building. Students will make their graphs during week two as well. Students will being prewriting, drafting, and editing their persuasive pieces. The prompt will be "Should people recycle? Why or why not? Cite specific examples from your research to support your position." The third week will be used for building their structures out of recyclable materials, making their commercials, and presenting them. The overall winner for this project will be chosen in July at an Professional Development event that Polk School District puts on. Students will revise and publish the final copy of their persuasive paper. Students will be assessed throughout his process by using a ticket out the door strategy. Students will answer a formative question that will help guide the instruction. The assessment questions will range from standards based questions, questions about the technology they used, and reflection questions in which they will discuss ways that they could have done things differently or better.

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Week 1:
Science: Students will be divided into groups by the teacher to ensure equal skill level and knowledge among the groups. Students will begin to research and investigate landfills. I want students to develop their own opinions, ideas and theories about the landfills. Once students have developed their opinions, we will begin discussing ways to reduce the amount of garbage that ends up in landfills. I want to discover with my students what ways are out there besides the obvious which is, recycling. I want to see what kind of ideas they/we can come up with to help solve the problem of landfills becoming to full. Students will also begin to look at how architects, builders, and designers have used materials to create structures and buildings out of recycled and reused materials. We will have the supervisor of Westside Recycling come to talk with the students about 3R's. He will make himself available for communication with the students via email through the entirety of the unit and project.
Math: Students will create a survey and collect data from 3 non-third grade students. Students will develop the survey questions and categories. We will review data related vocabulary because we learned about it around two months ago. Once the survey is completed, students will add their own answers to the survey as well. Students will create a graph to represent the data they collected.

Week 2:
Science: Students will continue their research to find possible design concepts for their building. We will discuss the building requirements during this time. I will allow students to input opinions about the requirements that I mentioned above to see if there is anything that needs to be changed or added or taken away from them. I will discuss the commercial part of the project with the students at this time as well. I will ask them to help me develop a rubric to assess the commercials using Google Docs or another online collaboration tool that will allow students to edit and see changes in real time. Once we have the assessment piece in place, we will continue working in the same groups that were assigned last week. Groups will work collaboratively to come up with a design to meet the criteria that we agree upon. They will be required to draw a sketch on paper or use a design app of their choosing to create a digital "sketch."
Math: Students will compile the data collected into a class Google Spreadsheet. Then, we will create different graphs throughout the week to reflect different aspects of the data.
Language Arts: Students will use the information they found in their research about landfills and recycling to develop ideas based on the prompt, "Should people recycle? Why or why not? Cite specific examples from your research to support your position." They will be allowed to use their iPads for research during the entirety of the writing process. Using Poplet or another brainstorming app, students will get their ideas listed for beginning their papers. Once they have some ideas they will complete an outline to use to create their first draft. Students will draft their persuasive pieces and then edit them. They may choose to use paper and pencil, Pages on the iPad, or the computer to write or type their drafts.

Week 3: Students will begin the week by building their structures. They will have one team member be a camera person to record clips and take pictures for their commercial. While not filming the team member will help build the structure. On building day we will have an Engineer come and he will start by giving some general pointers and suggestions. Then, as students build he will be facilitating and available for questions. The high school construction class will also come to help. They will be able to assist groups in the building process as well. Once the students have built, tested, filmed and photographed their structures, they will begin working on their commercials. Students will finish their chosen advertisement and will present them to the class. There are four third grade classes. Each class will choose three to present to the grade level and one advertisement will be chosen from each class by students, teachers, administrators, and our project collaborators. The chosen ads from each class will be presented at our Annual Mobile Minds University and a winner will be chosen from the four and will receive a $100 gift card to Wal-Mart for each group member.
Language Arts: Students will continue with the writing process and focus on revising and their final copy. Students will type their final copy and I will feature them on my online classroom.

Product:
Students will create either a commercial, print ad, or a radio ad to advertise the building they will create using recycled materials. They will use iMovie, Pages, Easelly, Garageband, or another iPad app of their choosing with teacher approval. Students will be likely to care about this project because they will be put in a situation where their help is needed. I will assess this project using a rubric that they will contribute to. Throughout the project the students will give each other feedback on their projects to help guide each other. Students will also write a persuasive paper about recycling that will go on my Online Classroom.

Technology Use:
Students in this context will use iPads for the majority of the aspects involving technology. Students will use iPads to access the internet and apps that will be used in multiple facets. Students will use the iPad email function to communicate and collaborate with the professionals that have agreed to assist in this project, this will support the collaborative indicator. Students will use the iPads to research landfills and gather information about how to reuse and recycle materials, this supports the Student Role: Explorer indicator. I will allow students to come up with their own questions and research more in-depth so we can come up with ideas together, this supports the Teacher Role: Co-Learner/Co-Investigator indicator.

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Students will use Google Docs to contribute to a rubric for assessing the advertisements they will make as well as the building criteria. By allowing students to help define the criteria in this manner it will strengthen the collaborative indicator and add the assessment piece which will be Generative. Students will use the iPads to create an advertisement and construct a persuasive paper. This will support the Student Role: Producer indicator. The overall tasks will provide the means for the Authentic Indicator. From researching landfills to designing their building the "hook" really sets students up to want to work on this project. Students will have many ways to use technology throughout.

References and Supporting Material:

This website is where the idea for building the towers came from: https://www.teachengineering.org/view_activity.php?url=collection/cub_/activities/cub_environ/cub_environ_lesson05_activity3.xml
This website shows homes that are built from shipping containers. We will look at it to learn more about reusing materials: http://www.thedailygreen.com/green-homes/latest/shipping-container-homes-460309
This website features articles about building that were built with recycled materials: http://makewealthhistory.org/?s=mockbee
This is an activity to introduce the 3R's Reduce, Reuse, and Recycle: https://www.teachengineering.org/view_lesson.php?url=collection/cub_/lessons/cub_environ/cub_environ_lesson05.xml
We will use this template to use as a guide to help develop our criteria for our towers. https://www.teachengineering.org/collection/cub_/activities/cub_environ/cub_environ_lesson05_activity3_worksheet_tedl_mhf.pdf
This is a presentation to use on the actual day of building: https://www.teachengineering.org/collection/cub_/activities/cub_environ/cub_environ_lesson05_activity3_presentation_tedl_mhf.pdf
This is an extension we will use in Math one day in the third week: https://www.teachengineering.org/collection/cub_/lessons/cub_environ/cub_environ_lesson05_homework.pdf
This is a website students can use to help explore the concepts of the 3R's: http://www3.epa.gov/recyclecity/
I will use this as a formative assessment to make sure students understand what can and cannot be reused and recycled.