Project Base Learning Unit: 7-8 Art + Architecture Unit

Teacher Overview

This unit is designed for 7th - 8th grade. This unit is taught in collaboration with the art, math and science teachers. These lessons will explore the design elements and basic structures in architecture, examine the ecological, social and economic advantages to green building, technologies and materials; renewable energy options; and energy performance metrics. Students will build a green "dream" home that utilizes structural architecture design elements, green building standards and examines how "form follows function" to address of the challenges of geographic location, climate, site selection, house orientation, energy/water efficiency, and spatial limitations.

PBL Project Overview	
Project Title: Art and Architecture	Duration: 4 months
Content Area: Visual Arts	Grade Level: 7-8
Integrated Content: Science, Visual Arts, Math	Teacher: Art Teacher, 7-8 Science Teacher, 7-8 Math
Project Description: Students will work collaboratively to design and build a model "green home". Groups will research historical and contemporary architects and architectural elements, tour local "green" buildings and homes, develop an architecture blueprint and use proportional reasoning to construct a model home to scale. Students will present their finished "green homes" to students, teachers, parents and community members. They will present upon the design, planning and construction process of their homes and talk about the green design elements they applied meet the needs of the user and the environment.	
Driving Question(s): As an architect how can you utilize historical architectural elements and contemporary green building standards to design a low environmental impact dream home? Essential Question(s): Why is architecture considered "art"? What connections can I find between art, architecture and design? How is green building good for the environment?	
Content Standards: Visual Arts Grade 8: Standard 4: Relate and Connect to Transfer - Concept 3. Visual arts provide an opportunity to explore sustainable environments, design and architecture	
Science Grade 8: Standard 2: Life Science - Concept 1: Human activities can deliberately or inadvertently alter ecosystems and their resiliency Social Studies Grade 7: Standard 1: Number Sense, Properties, and Operations - Concept 1. Proportional reasoning involves comparisons and multiplicative relationships among ratios	

Instruction

Performance Objectives: *What must all students know and be able to do as a result of this PBL experience?*
Students will have a basic understanding of the role art and architecture plays in our world through the design and construction of an original green "dream" home.

Evidence of Success: *How will you know students have successfully achieved objectives and standards?*
Students will have successfully achieved the project objectives and standards when they can clearly address the structural design elements included in their design, describe the green building standards included in their home, and explain how "form follows function" to address of the challenges of geographic location, climate, site selection, house orientation, energy efficiency, and spatial limitations.

Entry Event: *Describe how you will engage students and introduce the project's driving question.*
Students will first be introduced to architecture in art class. In science class students will be introduced to renewable energy sources and green building practices. Students will the take a field trip to walk through local community green building and homes to examine different design elements. Students will then begin to discuss the role the architecture and the affects that green building design has in our world.

Content Lessons: *Identify any content on which you will provide instruction or embed learning activities.*
In art class, students will examine the use of line, shape, texture, form, space and balance has in architecture. They will also study the structural elements of architecture and learn to identify architectural elements in detail and their relationship to the surrounding landscape. Then students will research famous architect and render a building designed by that architect, labeling architectural elements in the drawing.

In science class, students will talk with local experts work in the professional fields of: green building, architecture, solar/renewable energy, and energy efficiency and sustainability.

Resources: *Identify any resources, personnel, or materials you will need.*

School-based resources (people and facilities)	*Technology (websites, apps, presentation tools)*	*Materials (publications, manipulatives, supplies)*	*Community (partners, speakers, experts, helpers)*
7-8 Math and Science Teachers. Architecture Packet: Rendering Project Video: Intro to Architecture https://youtu.be/xkPnJ06KAv4 What is green building? https://youtu.be/MyIOtsx3wDs Basic architecture structures: https://youtu.be/IKMAyLT6AIY	iPads Chrome books Websites: http://www.greatbuildings.com EPA Green Building: https://archive.epa.gov/greenbuilding/web/html/ Green Building Council: https://new.usgbc.org USGBC-Colorado: https://www.usgbc.org/usgbc-colorado Illustrated Architecture Dictionary: http://www.buffaloah.com/a/DCTNRY/vocab.html Passive Solar Homes: https://www.energy.gov/energysaver/energy-efficient-home-design/passive-solar-home-design	Green Building, Renewable Energy and architecture books from school library. Design Thinking Process Worksheet LEED green building system	Speaker: Green Design Architect Experts: Sunsense Solar Energy Speaker: Exec. Director Clean Energy Economy for the Region Local Building/House Tour

Assessment and Reflection

21st Century Skills: *Will these be explicitly taught and assessed, or simply encouraged?*				Formative Assessment Tools		Summative Assessment Tools	
		Assessment (if applicable)		Quizzes/Tests		Written Statement	x
Collaboration	x	Collaboration Assessment		Journaling/Learning logs		Oral presentation (rubric)	x
Communication (Presentation)	x	Summative Rubric		Plans/Outlines/Prototypes	x	Other product (rubric)	
				Rough Drafts	x	Test	
Critical Thinking	x	Summative Rubric		Checklists	x	Peer evaluation (rubric)	x
Creativity	x	Summative Rubric		Anecdotal notes		Self evaluation	
Reflection Tools							
Portfolio Entry	x	Class Discussion	x	Survey		Focus Group	

Product

Culminating Product: *Does the culminating project have a group component, an individual component, or both, and how will they be assessed?*			Presentation Audience	
	Description	*Assessment Tool*	Class	
Group	Each group will present their design to students, teachers, parents and community members in a special "Architecture Fair" at school.	Summative Rubric Written reflection Peer evaluation (given to audience)	School	x
			Community	x
Individual			Experts	
			Web	

Timeline: *List any key dates or milestones for this project.*

Available Class Time:

- Art class – 2x/week (45 minutes each class)
- Science class – 2x/week (45 minutes each class)
- Math class – 4 classes total (45 minutes each class)

- **November** (3 weeks / 6 art classes): Architecture Unit in art class
  - Week 1: Introduce students to architecture: Styles and Elements of the Past + Present
  - Week 2: Green Building + Design Process
  - Week 3: OFF / Thanksgiving Break
  - Week 4: Introduction to Project + How to draw like an architect – video series (https://youtu.be/b_bEps3hJLI)

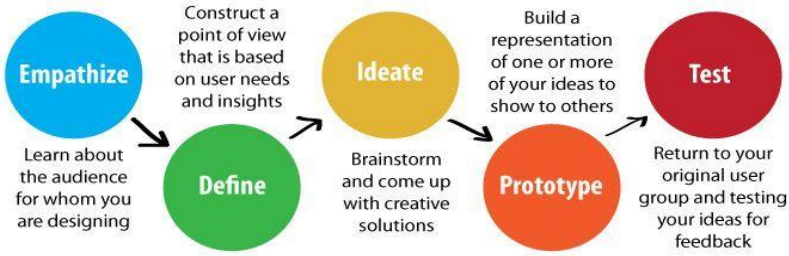
- **December** (3 weeks): Research green design/renewable energy, energy efficiency
  - Week 1: Green Houses Field Trip + Guest Speakers (Combine science and art class / 2 days)
  - Week 2-3: Alternative Energy, Brainstorm design elements for blueprint (2x Science classes)
    Proportions, scale and ratios (2x Math Classes)
    Learn SketchUp for Floor Plans Blueprint (2x art class)

- **January** (4 weeks): Blueprint Design / Begin construction
  - Week 1-2: Work on Draft Floor Plan (2x Science and 2x Art Classes)
  - Week 3: Get feedback / Make Changes / Finish Draft Blueprint (2x Science and 2x Art Classes)
  - Week 4: Intro to construction (1x Science)
    Begin construction (1x Science and 2x Art Classes)

- **February** (4 weeks): Construction all month (2x Science and 2x Art Classes per week)
  - Week 1-3: Construction (Science and Art Classes)
  - Week 4: Finalize building / Write Reflection / Public Presentation – February 28th.

Design Thinking

THE DESIGN PROCESS has five stages:



We will be using a modified design thinking process for this project. You will think about the needs of the user of the house (you), define the problems around building in your selected area with as little impact as possible, and ideate/brainstorm the design elements for your house. Your floor plan blueprint will be your prototype. Many of the changes that happen during the testing/redesign phase will instead be done during the draft/finalize process of your blueprint design. Just like real architects, all major changes need to be decided during the blueprint phase. Only minor modifications can be made during the construction process.

1. **Empathy (Thinking of the user of the house)**: Research the geographical area, climate and ecosystem that you are designing in, and identify the characteristics of this region.
   Notes:

2. **Define/Problem to Solve**: From your list above, list the challenges that need to be addressed in the following areas:
   - **Geographic Location**
   - **Climate**
   - **Site Selection**
   - **House Orientation**
   - **Energy/Water Efficiency**
   - **Spatial Limitations**
   - **Green Building Standards (for this region)**

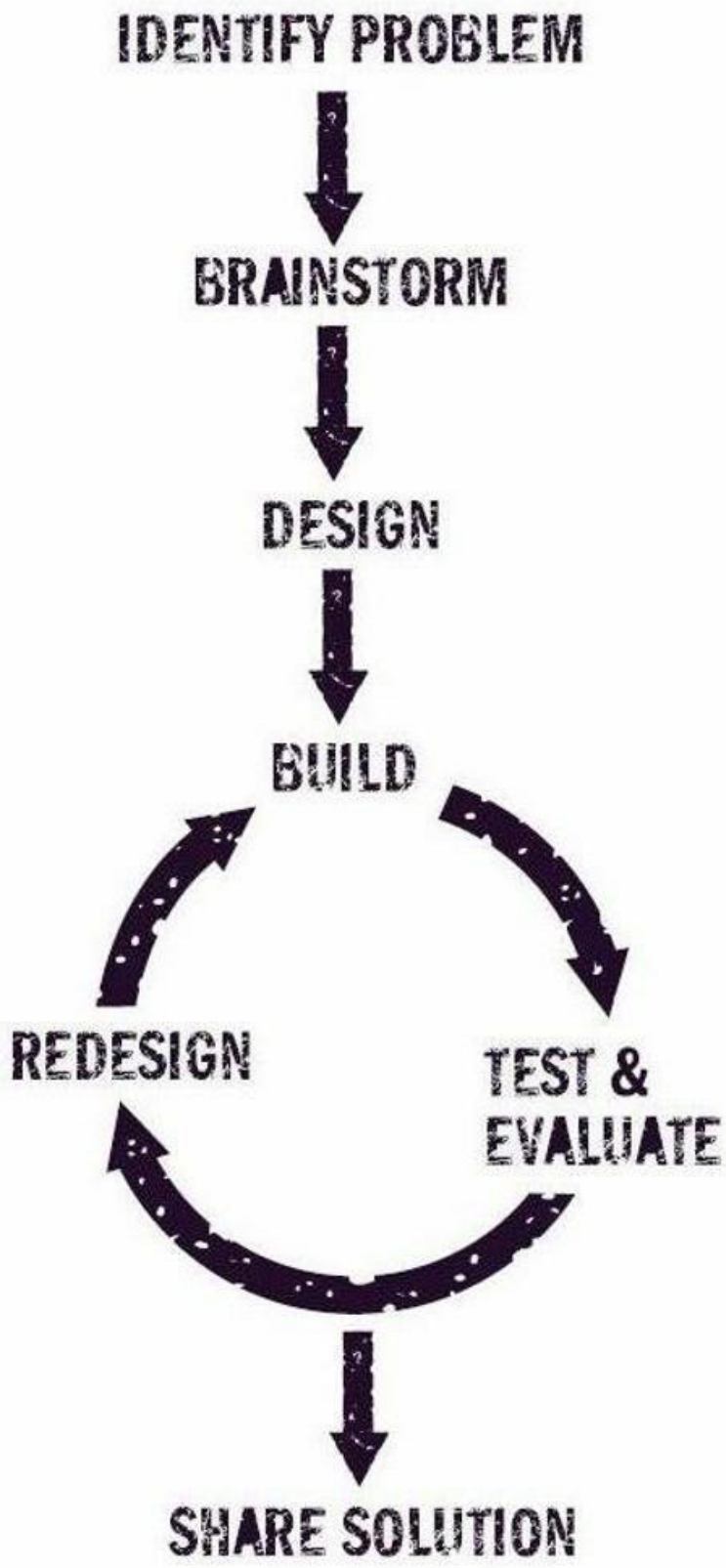
3. **Design Ideas**: On a separate paper, generate as many ideas as you can to identified and meet the green building standards. Do not judge or debate ideas as this limits creativity. Go for quantity of ideas!

4. **Prototype** - Four steps:
   1. Organize all design ideas and create a blueprint draft.
   2. Get feedback and make all major changes to your blueprint draft.
   3. Create a final blueprint design.
   4. Using your final blueprint, construct a model green home to scale.
   5. Redesign any problem areas that come up during the construction process.

5. **Test/Feedback** - Get feedback from other designers in your class about would help improve the design for maximum energy efficiency.

6. **Share Solution** – Present your model home and share the reasoning behind your design.

THE DESIGN PROCESS



PROJECT SCHEDULE

Team Members: _____

Create a schedule for your group of what needs to completed each week during each class.

MONTH: _____

Date	Weekly Goal	Action Steps	To Finish Next Week
Week of:	MATH: SCIENCE: ART:	Person 1: Person 2:	
Week of:	MATH: SCIENCE: ART:	Person 1: Person 2:	
Week of:	MATH: SCIENCE: ART:	Person 1: Person 2:	
Week of:	MATH: SCIENCE: ART:	Person 1: Person 2:	

Name: _____ Partner: _____ Grade: _____

Architecture Rubric

Score each project. (Circle your answer choice.)

- **Advanced:** The student consistently demonstrates the behavior and helps others in a kind manner.
- **Proficient**: The student demonstrates the behavior most of the time.
- **Developing:** The student needs frequent reminders.

Category	Advanced - 3	Proficient - 2	Developing - 1
Design Complexity	Both the blueprint designs and model use accurate measurements, ratios and scale. The design is complex and incorporates more than 3 difference architectural elements and a wide variety of green building standards. Includes a renewable energy source.	Both the blueprint designs and model use accurate measurements and scale. The design is complex and incorporates 2-3 difference architectural elements and some green building standards. Includes a renewable energy source.	Both the blueprint designs and model do not have accurate measurements or scale. The design is simple and incorporates 1-2 difference architectural elements and very few green building standards. Does not include a renewable energy source.
Design Effectiveness	An excellent design which would work very well in real life. The house is oriented in the correct direction to receive maximum passive solar energy. Bedrooms, bathrooms, and kitchen are placed effectively with enough room for traffic to flow. Service areas are appropriately places.	A good design which would work very well in real life. The house is not quite oriented in the correct direction to receive maximum passive solar energy. Bedrooms, bathrooms, and kitchen are placed do not allow for traffic flow as well as it should.	A fair design which would work. More than one area is not very effective, or traffic pattern does not flow as well as it should.
Drawing Standards	Architectural renderings and blueprint plans are drawn using high quality, accurate lines. Value, textures and labels are included in the work. Blueprints were drawn using a 1" = 4' scale. The mathematical equations provided in math class were used to precisely calculate the correct spatial proportion and ratio for the blueprint.	Architectural renderings and blueprint plans are drawn using satisfactory line quality, accuracy and shading. Some labels are included in the work. Blueprints are drawn to 1" = 4' scale. The mathematical equations provided in math class were used to calculate accurately the spatial proportion and ratio for most of the blueprint.	Architectural renderings and blueprint plans were drawn without much attention. Very few details are included. Blueprints are drawn to 1" = 4' scale. The mathematical equations provided in math class were not properly applied to calculate the correct spatial proportion and ratio for blueprint.
Model Craftsmanship	Model was constructed a well built, sturdy and professional looking building. Model has a sturdy foundation and solid wall/roof construction. Interesting details were added to the model. The model house structure was measured accurately and precisely built to scale using the ratio conversion equations taught in math class.	Model has a good foundation and solid wall/roof construction. Model has less detail but is still a well built and professional looking. The model house structure was mostly measured accurately and built to scale using the ratio conversion equations taught in math class.	Model is inaccurate with no detail. Model is poorly constructed. The model house structure was not built to scale or measured accurately. The ratio conversion equations taught in math class were not applied properly.

Name: _____ Partner: _____ Grade: _____

Architecture Reflection

For your portfolio, reflect upon your finished work and your creative process by writing a reflective statement that addresses the questions below. Please use complete sentences, proper grammar, spelling and punctuation.

- **What is the geographical location and climate of your dream home? Why did you choose this?**
- **What architectural elements did you add to your design to make your house unique?**
- **Explain how "form follows function" in your design.**
- **What skills did you apply to accurately design and construct your house?**
- **How do the green building standards in your home help protect the ecosystem in your location?**
- **What are your favorite qualities of your house design and why?**
- **What are the advantages and disadvantages of building a green home?**
- **What about this project was challenging for you? How did you and your partner overcome the challenges?**
- **If you could change anything in your design what would it be and why?**