

Brownies Who Build



Everywhere you go, there are so many buildings big and small all around you! But how exactly does a building get...well...built? Many people work together to construct each building that you see—and there are so many different jobs in the construction industry! First a building has to be designed, then supplies are purchased, and then a construction plan is created! After all of those tasks are completed, you have to ensure that you can *safely* construct your dream building!

- Steps:**
1. Design and Coordination
 2. Cost and Estimation
 3. Planning
 4. Safety and Site Management
 5. Trades

Purpose:

When I have earned this badge, I will understand the steps of the construction process, different construction careers, and how I can build something on my own!



Developed in partnership with



Step 1: Design and Coordination

Design is the *very first step* in the construction process because building something requires you to have a plan. A design shows the most important parts of the construction—like how many classrooms a school will have and how they are set up. A design can showcase the construction’s creative elements, like what the school looks like from the outside or what color the walls should be painted. Property owners work with experts known as **engineers and architects** to make sure their vision can be brought to life. These individuals help to decide what type of materials to build with, because you can’t make a safe roof out of heavy rocks! Some people specialize in **commercial design** and others focus on **residential design**.

You can show off your design by creating a **model!** A model can be anything that lays out parts of the design, like where things go, or what they look like. Many designers use computer programs to make digital models of their buildings.

Coordination helps to make sure the design of our buildings make sense. Models can help us see that everything looks good and is where it’s supposed to be!

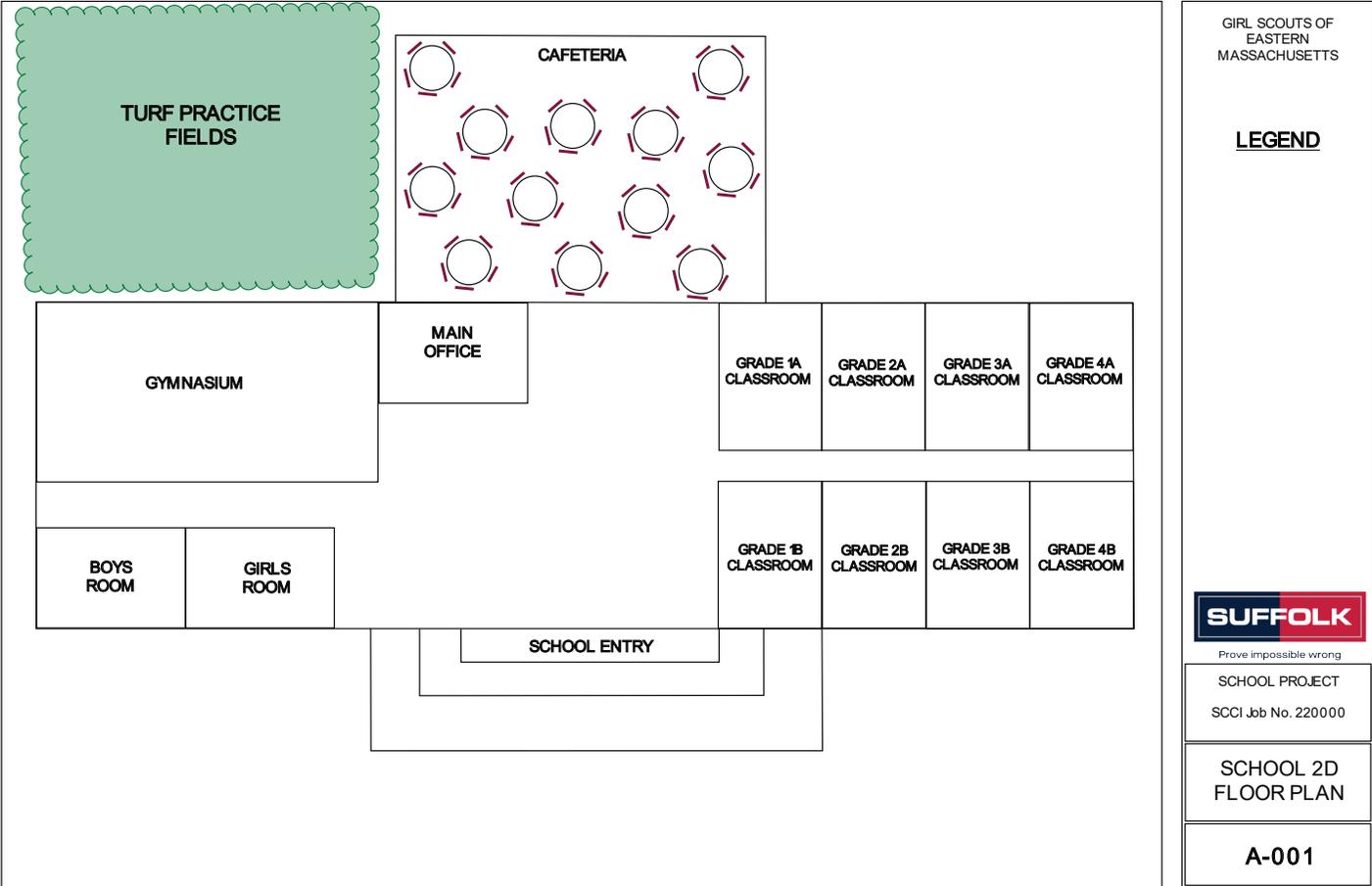


Activity

School 2D Model

First, consider borrowing the book *If I Built a School* by Chris Van Dusen from the library or listen to a read aloud video you find online. This is a fun story about designing your own school.

Then, put your design skills into action by modeling your dream school! Floor plans are a type of 2D model. They include parts of a building like the outside and inside walls, windows and doors, and furniture. For example, look at this school's 2D model! It shows how the building is shaped and what it has inside of it. Designs are used in every step of the construction process, so be sure to consider all of your school's needs! Start out by writing a list of rooms you need to put in your school. Then start arranging them in your own 2D model. Should you place the gym near the fields for outdoor sports or should you put the gym near a parking lot? How are you going to get the food to the cafeteria? Is the parking lot big enough for the food delivery trucks and buses? Use your imagination and creativity to make sure your school design is truly *yours!* The sky's the limit!



Activity



Choices – do one:

Partner up to make a new school.

Work together with a buddy or two to combine your 2D models into one, big school! Is it easy to agree on the design of a school when working with a buddy? What new coordination challenges do you see? Do you have too many classrooms? Enough bathrooms? Did you forget to put in a music room? Brainstorm ways to redesign your school to make it the best it can be!

Test out building materials.

Picking the right materials is a very important step in the design process. Gather materials for a fairy house. You can find your materials almost anywhere—look through the recycling and search outside. Consider materials like wet sand, rocks, small sticks, toothpicks, cardboard, plastic bottles, glass jars and more! Spend some time building your house and experiment with the design. Which of your materials are strong enough to build the walls? What purpose do windows have in a home and will you use something in particular for them? How about the roof? Can you build every part of your fairy house with the materials you chose?

Visit a school.

Visit a school near you and think about what decisions the designers made when they created the model of the school. Do you think the school you see today is exactly what they made in their design? What do you think are the most creative parts of the school's design? A school is a big building to design. Designers often use computer programs to help them plan out big buildings like schools, hospitals, and shopping malls. Have you ever designed something on the computer? If possible, have someone from the school give you a tour to answer your questions, or bring in another expert, like an architect.



Step 2: Cost and Estimation

Big buildings can cost a lot of money because construction companies have to purchase resources and hire people to work on the building. This Boston University Data Science building cost more than 62,000,000 boxes of Girl Scout cookies to build!

In **estimation**, the cost of everything needed to build a project is calculated. Then a document, known as a **budget**, is used to help keep track of where the money was spent. This way, companies always know if they have enough left in their budget to finish the construction project!

Your troop may have a budget to keep track of when you spend money on activities and supplies, how much money you earn from selling cookies, and more. This helps your troop leaders to help you make decisions and plan your year! For example, if you don't have enough money in the fall, you might have to wait until the spring to go camping. In order to have the money to go on a camping trip, you set a goal of having each Girl Scout sell 50 packages of cookies. That's how budgeting works!



Activity

Choices – do one:

- Read a story about estimation.**
Want to learn more about how the estimation process goes in real life? Read Marissa’s story and see how she worked through the process of picking out building materials and supplies for her new restaurant. When you’re done, think about what you would have done differently or the same. Is it hard to not be able to pick what you want because the price is too high? What did you learn from this story?

[See Estimation Story \(Worksheet 1\)](#)

- Design your school.**
If you were going to make your own school, you would need a lot of materials—and the cost of those supplies adds up fast! First you’ll decide what you want to put in your school from a list of suggestions. Some materials will cost more than others, so choose wisely to make sure you don’t spend more money than you have. Circle the cost of each item you decide to buy. Next, you will make your school come to life by building a diorama of a single room. A diorama is a type of 3D model. In your room, you get to pick the materials for the floors, walls, and ceilings and design the place in whatever way you choose!

[See Design Your School \(Worksheet 2\)](#)

- Practice budgeting your own money.**
Your troop has given each of you \$20 to spend on toys, books, snacks, and more and—you get to decide how you want to spend it. Use the budgeting worksheet to put together your shopping list, balancing what you want and what you have money for. You will use small items like beans or beads to keep track of your \$20 and what you spend it on. The steps that you will go through to make your list is exactly what engineers and architects do during their budgeting. Builders have to make many decisions, like how many lights they want in a room versus how many lights they can afford with the money they have.

[See Budgeting Worksheet \(Worksheet 3\)](#)



Step 3: Planning

In construction projects, things need to be built in order. For example, you need to build your walls before you can paint them! The order in which you complete each project is determined through logic. Builders use logic in **planning** to figure out how a structure should be built.

You use planning every day when you pack your bag for school, complete your homework, hang out with your friends, go to sports practices, prepare for your music lessons, and do any other activities outside of school. You also use a lot of planning in Girl Scouts. You plan out what badges you'll work on this year, if you'll go camping, how many cookies you want to sell, how many booths you'll need to host in order to reach that goal, and much more. Sometimes, the order of these activities is important, and that is something you learn along the way!

See Real Planner's Cookie Booth (Worksheet 4)



Activity



Choices – do one:

Plan your Rube Goldberg machine.

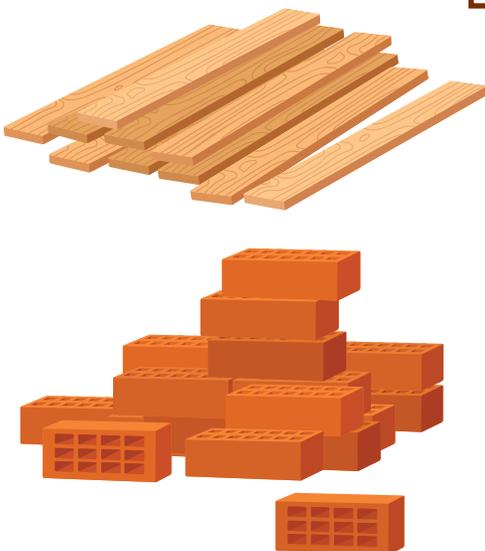
A Rube Goldberg machine is a complex series of events that when tied together, perform a simple task. They are made of found objects like dominos, balls, cardboard, boxes, and more. If you need some ideas, find a video online, then put on your planning hat and gather some materials. What is the task you want your machine to complete? How many steps will you need to reach your task? What order do those steps need to happen in? What is your role on the team? How will you contribute to success?

Plan your school field trip.

You're going on a school field trip where you'll be visiting the zoo for a whole day. Your group will spend the morning doing activities with the zookeepers, then you'll have lunch, then you will have 2 hours of free time to explore the zoo in small groups. As a large group, or in groups of two to three, plan out your free time. First, look up a zoo map or make one of your own. Then make a list of the exhibits or animals you want to see and plan how much time you'll spend in each place. Which animals do you want to see the most? Does everyone agree? What order will you visit the animals in? Does the order matter? How will you make sure to spend your time wisely? Planners do this same activity when they are preparing for a project. They need to make sure they don't forget any supplies or important steps!

Plan your materials.

In construction, you must make good choices about the materials you are going to use so that you have a strong structure that won't cost too much to build. You also have to pick the right materials for the job! You don't want a house that will get too hot if you're building in the desert! Every single material used in a building has a purpose. Think about some common building materials like wood, bricks, and stone. Can you think of any others? Use the materials worksheet to explore some building materials that may be new to you and think about sustainability.



[See Materials Activity and Volunteer Discussion Guide \(Worksheet 5\)](#)

Step 4: Site Management and Safety

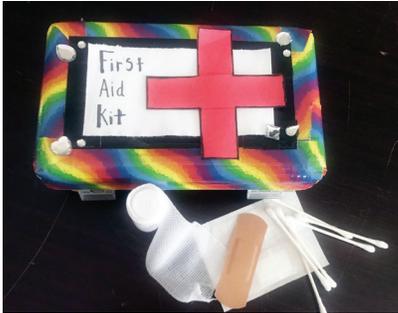
Construction workers always have safety in mind. When you imagine them—what are they wearing? And what do you imagine a construction site looks like?

A construction project of any size can be dangerous if safety isn't the top priority. That's why construction workers wear **personal protective equipment (PPE)**, such as hard hats, gloves, goggles, boots and high visibility safety vests. Site safety managers help make sure that all the work on a construction site is being done on time and, most importantly, done safely. However, it's everyone's responsibility to look out for each other and make sure everyone remains unharmed. It is important to be prepared for emergencies and construction sites make sure to have the right supplies available.

Construction workers also install some of the most important safety features in your schools. They make sure that fire alarms and sprinklers are installed properly, they make sure your classrooms are well lit, they make sure the school has heating and cooling so you are safe in extreme temperatures, and they install the wiring for phones and announcement systems.



Activity



Choices – do one:

Make a first aid kit.

People in construction wear protective gear in order to avoid getting hurt. This includes hard hats, reflective vests, steel-toed shoes, safety glasses, respirators, gloves, and more. If you have some of these available to you, try them on and test them out. Just in case of accidents and emergencies, construction sites always have medical supplies. Does your troop or your home have a first aid kit ready in case of emergencies? A first aid kit is a container of supplies that you might need when someone gets hurt. First aid kits often contain band aids and disinfectants for wound care. Brainstorm what your troop or family might need in a first aid kit. Remember to plan for the different seasons! If your troop or family doesn't have a first aid kit, talk to an adult about putting a first aid kit together.

Play a game of Supervisor Says.

On a construction site, it is the supervisor's job to make sure the project gets done correctly and with safety in mind. Just like you would play Simon Says, play a game of Supervisor Says: safety edition! Stay safe at the construction site by paying close attention to what the supervisor says. Is everyone wearing their protective glasses and hard hat? We don't want anyone hopping on one foot because they stubbed their toe!

Learn about using the right tools for the job.

Do you know how to safely use tools like a saw or a screwdriver? What personal protective equipment do you need to wear while using these tools? Match the tool to the task on the Tool Safety worksheet and be sure to note when you need PPE! You can even experiment with holding tools and learning more about the jobs they do if you invite a guest to your meeting. Your guest can be someone you already know or someone new you find by connecting with a professional organization, which is a group for people who do the same job. For example, there is a group called the National Association of Women in Construction.

[See Tool Safety Worksheet \(Worksheet 6\)](#)

Step 5: Trades

What are you an expert on? Is it something you learned by yourself? In school? Or maybe by helping someone else?

Tradespeople are experts with special knowledge of one part of a construction project! An electrician is just one example of a tradesperson—there are so many different skills that you can learn! For each part of a building there is a tradesperson with special knowledge whose job it is to build and maintain it.

Every trade works with different materials and tools. Some use a hammer and nails, some work in machines high above the ground, and some create the parts of buildings that make them beautiful!



Activity

Choices – do one:

Show off something you're great at.

Tradespeople are experts in a certain skill, like building something or putting something together. Each of us has something that we know a lot about or consider ourselves an expert in! Do you make jewelry? Are you a master Lego builder? Are you good at telling jokes? Pick one of your special skills and show it to the group.

Design a uniform.

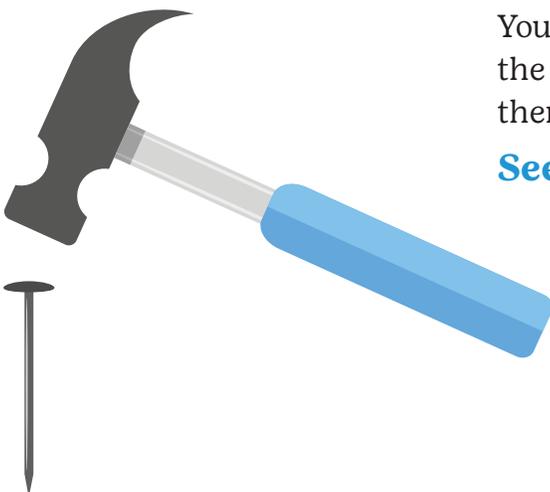
As a Girl Scout you have a uniform. What does your uniform do? Why do you wear it? Probably for many of the same reasons, people in certain jobs wear a uniform. Can you think of anyone or any job that has a uniform? Why do they wear it? Use a piece of paper to draw a uniform for the job that you want one day. Even if your job has or doesn't have a standard uniform, use your creativity to design one. Once you're done, share your job and your uniform with the rest of the group.



Learn about the trades.

There are so many trades and there's so much to learn about each one! Every tradesperson faces different challenges, uses different tools and materials, and knows a lot about their trade. Every part of a building is important, and everyone's special knowledge helps complete the building process. For example, certain people build the walls, others put on the roof, some put in the sinks and others put in the lights. All of these people go through different training and will need to be paid differently in the construction project. You would need help from all of them to build a school! Use the tradesperson worksheet to learn about some trades, then pick out your character for a skit.

[See Tradesperson Worksheet \(Worksheet 7\)](#)





Congratulations on becoming Brownies Who Build!

Please complete the evaluations below to provide feedback on your experience and receive verification to get your Brownies Who Build patches:



Adult Survey:
bit.ly/jwbsurvey1



Youth Survey:
bit.ly/jwbsurvey2

Thank you for your feedback.

You've earned the patch Brownies Who Build. Put your design, coordination, budgeting, and planning skills into action. For inspiration, check out more Kids Projects & Activities:

- Home Depot www.homedepot.com/c/kids
- DIY-U by Lowe's www.lowes.com/diy-projects-and-ideas/workshops
- Build Your Future www.byf.org/construction-exploration-activities-to-try-with-all-student-levels



Words to Know

Engineer	a person trained to know how to safely design and build
Architect	a person who designs buildings and supervises construction
Commercial design	refers to designing public buildings; the name commercial comes from the word commerce, which means to sell
Residential design	describes designing buildings where one person or many people live; the name residential comes from the word residence, which means a place to live
Model	a physical or digital representation of the building or the idea of the building
Design	a detailed solution showing your ideas or intentions
Coordination	making sure everyone's design solutions fit and work together
2D	when something is flat or has just length and width, like a square
3D	when something has length, width, AND depth, like a cube
Estimation	a calculation of how much a construction project will cost in total
Budget	a place to keep track of how much money is available and how much money is spent
Contractor	someone hired to work on a specific project for an agreed upon amount of money
Unit	a way of measuring quantities of materials needed for building—for example using length, weight, or capacity
Planning	the process of identifying the steps needed to build a structure, splitting them into activities, and ordering them logically
Critical Path	the sequence of activities in a schedule which must be completed in a particular order
Milestone	a significant event that occurs during the project
PPE	personal protective equipment; anything someone wears to keep them safe
Trade	a job with a special skill set and specific training

Estimation Story

Section 1:

Marissa is building a restaurant! It has been her lifelong dream to share her family's favorite recipes with her neighborhood. Marissa has been saving her money for 10 years to make her dream come true and she's been planning out all the details in her journal. Marissa purchased a plot of land down the street from her home, which will be very convenient when running her restaurant. With all the construction and cooking at the restaurant, Marissa has a lot of long, hard days of work ahead of her. Marissa spent half of her savings when buying the land, so she has to be careful when spending the rest so she doesn't run out of money before the project is completed.

What should Marissa do next?

Section 3:

Marissa's next step is to make decisions regarding the materials she wants to build with and which appliances to put in the restaurant. Before she makes any decisions, she goes to the hardware and appliance stores to look at the prices of the items on her shopping list. First, Marissa needs to choose between brick or wooden walls. She selects brick because it reminds her of home and she likes the aesthetic. Next, she chooses how large her refrigerator and stove will be, and how many sinks she should have. She picks one giant refrigerator instead of two because it will allow her to save money with electricity costs in the future. Marissa also decides that having two stoves will be important when cooking for all her guests. These decisions leave her with less money for sinks than she originally wanted. Therefore, she puts in one sink next to her dishwasher so she doesn't have to wash all of the dishes by hand.

Has Marissa remembered everything she needs in her kitchen?

Section 2:

Marissa visits other restaurants in town to get ideas for how big her kitchen should be, how much space she should have around tables for guests, and what colors she wants to paint the walls. Marissa decides to hire a design company to help her plan out the rooms and find out how much the building materials will cost. There are lots of rules that she and her construction team have to follow for safety, so Marissa wants to work with an expert. The design company creates the blueprints to show how many rooms there will be, where the windows and doors will go, and where to put the sinks, refrigerators, and stoves. Working with the design company was really helpful, but costs 1/8 of her remaining budget.

Does Marissa have enough money to make her dream come true?

Continued on next page

Estimation Story (p.2)

Section 4:

Next up on Marissa's list is the dining area and she has $\frac{1}{4}$ of her money left. Marissa decides against hiring an interior decorator to save some money and to buy more materials. Marissa's family grew up near a farm so she wants to design her restaurant with some farm themes. She visits her friend's farm hoping to find some old farm tools to put inside her restaurant for decoration. Marissa and her friend Evelyn make a deal: Marissa can take six items to decorate her restaurant from the farm IF she promises to make breakfast sandwiches with eggs from Evelyn's chickens. This is a great deal for Marissa and an exciting new partnership that saves her money on decorations and the stress of finding a source for her eggs.

What other suggestions would you give Marissa on saving money on her decorating?

Section 5:

The last step before Marissa can open her restaurant is to hire the staff. Marissa needs to save enough money in her budget to pay people for their work. In the future, the money guests pay for their meals will help pay Marissa's workers. She needs a cook, a hostess, some servers, a few dishwashers, and a grocery supplier. As another way to save money, Marissa will take on the role of "manager" herself. Marissa has a couple friends who want to support her restaurant and are looking for work, so she hires a few local teenagers as servers and dishwashers. Marissa wants to make sure she gets all the recipes right, so for now, her mom will be the cook. Marissa is very excited to start her business surrounded by family and friends. It's finally time to pick an opening day!

Do you think Marissa has a good team to open her restaurant? Is she ready to go?

Glossary

Blueprint- A 2D design that shows the basic outline of the building and where important things like doors, windows, plumbing, and electricity will go.

Appliances- The machines or devices that do jobs for people; includes dishwashing machines, clothes washers and dryers, stoves and ovens, microwaves, and more.

Aesthetic- A theme or set of design choices that can make you feel a certain way about the space you are in.

Interior Decorator- A person who specializes in designing spaces by picking out paint, furniture, art, background music and more.

Hostess- The person who waits at the front of the restaurant and then brings people to their tables and gives them a menu.

Design Your School

Step 1:

Imagine you are building your own school, make some decisions about what you'll put in your school with a budget of 15 Building Bucks. Building Bucks represent money and you can use play money or coins to help you stick to your budget. Circle the Building Bucks for the item you want to buy and count as you go. If you have play money, lay it down next to each choice. Make sure you can make a decision in each category without going over budget!

FLOORS - What material do you want to use for the floors?

Tile - 3 Building Bucks

Carpet - 1 Building Buck

WALLS - How many colors will you paint your walls?

Three colors - 3 Building Bucks

Two colors - 2 Building Bucks

One color - 1 Building Buck

CLASSROOMS - How many students do you need to fit in each classroom?

30 chairs and desks - 3 Building Bucks

20 chairs and desks - 2 Building Bucks

GYMS - Do you want a jungle gym outside or a ninja warrior gym inside?

Jungle gym outside - 3 Building Bucks

Ninja Warrior Gym inside - 4 Building Bucks

RECREATION - Do you want a soccer field outside or a swimming pool inside?

Soccer field outside - 2 Building Bucks

Swimming pool inside - 4 Building Bucks



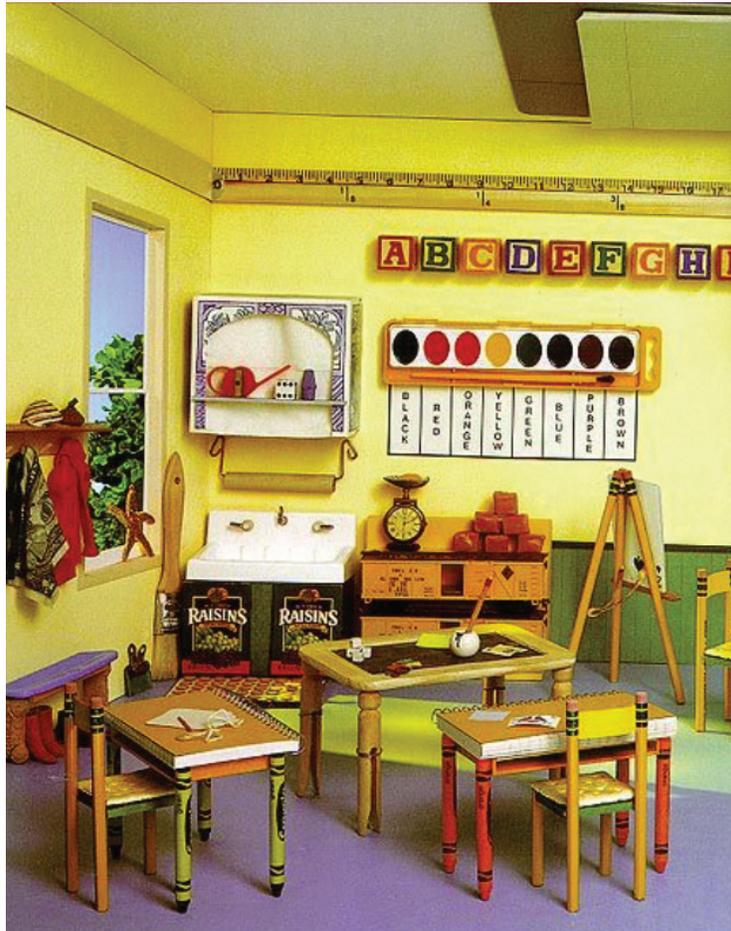
Expense Category	Choice	Cost in Buliding Bucks
Floors		
Walls		
Classrooms		
Gyms		
Recreation		
		Total:

Design Your School (p.2)

Step 2:

Your next task is to make a 3D model of one of the rooms in your school. A 3D model is sometimes called a diorama and usually you use a small box for your design. First, choose which school room you want to create. Next, gather your box and supplies like paint, glue, magazines, toothpicks, and more! Then, start making decisions about how to build out your space. What will you use for the floors? How many colors will the walls be? Consider the purpose of your room. Is it a space for learning, eating, playing or reading? How does its purpose affect the way you are going to decorate? What other supplies will you need in your room? For example, if you choose to design the library, maybe you want to put in shelves for the books and a comfy corner near the windows so people can read with lots of sunlight.

Get inspired- check out Joan Steiner's books, *Look-Alikes* or *Look-Alikes Jr.*, for some ideas of everyday items that can help bring your design to life!



Budgeting Worksheet

You have \$20 to spend at the store! Take a look at the list below and decide which items you are most interested in. You may choose more than one of any item if your budget allows, just remember to not exceed \$20!

Here is the cost of each item:

\$1 Apple, Banana, or Orange	\$6 Journal and pen	\$16 At home slime kit
\$2 Juice or Water	\$6 Water bottle	\$17 At home science kit
\$2 Hair bows	\$8 Book	\$18 Doll and dress
\$3 Package of cookies	\$12 New shirt	\$20 Painting kit and sketchbook
\$3 Bag of chips	\$12 Stuffed animal	
\$3 Markers and crayon set	\$13 Hoodie sweater	
\$4 Nail polish set	\$14 Basketball or kickball	
\$5 Pop-it toy	\$15 Blanket or pillow	
	\$15 Board or card game	

Start with 20 beads, beans, coins, or even some play money to represent your \$20. In the left hand column, write down the name of the item you want. Then, in the right hand column, lay down your "money" to represent the dollars spent. When you run out of "money," your list is complete! When everyone has finished their lists, partner up and explain your shopping choices to each other.

Item 1 _____	Cost _____
Item 2 _____	Cost _____
Item 3 _____	Cost _____
Item 4 _____	Cost _____
Item 5 _____	Cost _____
Item 6 _____	Cost _____
Item 7 _____	Cost _____
Item 8 _____	Cost _____
Item 9 _____	Cost _____
Item 10 _____	Cost _____
Item 11 _____	Cost _____
Item 12 _____	Cost _____
Item 13 _____	Cost _____
	Total Spent _____

Real Planner's Cookie Booth

Note to Volunteers: You can lead this activity by reading each line out loud to the Girl Scouts, then write the list in order on a whiteboard or number them below (use pencil!). This list can also be printed, cut into small strips, and arranged into the correct order by the Brownies.

As a group, plan out your cookie booth by putting the steps in the right order. There is no 100% correct answer because each group is different, but the order of some steps really do matter.

	Set a goal for the number of packages to sell at your cookie booth.
	Pack the car with cookies, a table, cash/change, first aid kit, and more.
	Decide which Girl Scouts and volunteers will come to the cookie booth.
	Plan out how many packages of cookies to bring to the booth.
	Assign roles at the cookie booth (greeting guests, money handler, restocking cookies).
	Set up a table, lay out the tablecloth, arrange and display cookies.
	Order cookies from the cupboard.
	Pick up cookies from the cupboard.
	Put on your uniform.
	Pack away unsold cookies.
	Talk to customers and sell cookies.
	Make change.
	Clean up the booth area.
	Learn about cookie varieties and the price of each package.
	Practice your sales pitch.
	Make a sign for your cookie booth.
	Advertise your cookie booth.
	Pack the first aid kit.
	Count the number of cookies sold and the money earned.

Materials Activity

Did you know that there are many building materials besides stones and wood planks? Let's look at some building materials that may be new to you. After reading about the material, describe some positive and negative characteristics. If you don't understand one of the description words, ask a volunteer for help.

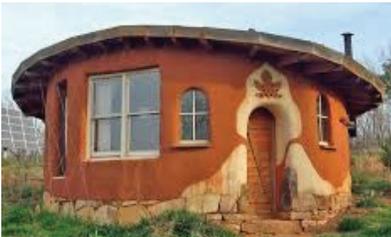


Plastic

Upcycled plastic can be formed into bricks and put together like building blocks. This gives the plastic a new life and purpose, instead of sitting in a landfill. Plastic is very strong and can take hundreds of years to deteriorate, which is why it is a good idea to repurpose it.

Pros

Cons



Cob

A mud mixture of soil, sand and straw is formed into walls. The materials are found nearby and there generally aren't power tools used, making the construction process very environmentally friendly, but you need an expert who knows how to build with cob. The thick walls are good insulators so you don't have to do much work to maintain a comfortable temperature.

Pros

Cons



Bamboo

A strong and unique wood, bamboo is one of the fastest growing plants in the world. Homes made of bamboo are popular in Latin America and Asia. Bamboo is lightweight, making it easy to build with. Bamboo does not work well in extremely hot or cold climates and is not fire resistant.

Pros

Cons

Materials Activity (p.2)



Adobe brick

An ancient building material made of clay and straw. Adobe homes are popular in the southwest of the United States. The bricks are biodegradable, meaning they can be broken down and left in nature because they are a natural substance. Using them for homes is a good idea because they are fire and pest resistant.

Pros

Cons

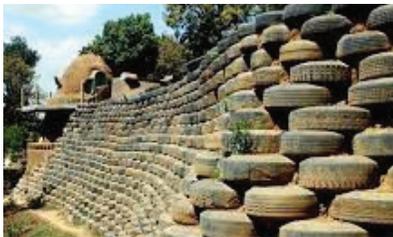


Straw bale

Straw is grown on farms and gets covered with plaster, which is a dry powder mixed with water to make a clay. These houses can be found in parts of Canada and the northwest United States and can be very resistant to rain, but homeowners must be careful to keep the straw dry, because moisture getting past the plaster layer can lead to mold and decay.

Pros

Cons



Earth-packed tires

Recycled tires from cars and trucks are filled in with earth materials for insulation. This means that they can soak up the heat from the sun during the day, then radiate it into the home overnight. All of the dirt inside these tires can make them very heavy, about 300 pounds! Tires can be cheap to use in building because once they are done on a car or truck, people don't want them anymore.

Pros

Cons

Materials Activity Instruction

For Volunteers to use when guiding the worksheet discussion for Girl Scouts.

Have you ever heard of a material or structure being called “green” when it wasn’t green in color? This actually refers to the way that building or material uses or preserves energy in a way that is environmentally or “eco” friendly.

Being “green” can mean many things, but in the world of construction it usually means that materials have been chosen specifically because they are natural and/or renewable.

- Natural resources are not man-made and do not have things added to them.
- Being “renewable” means that the material supply can be regenerated when you use it. For example, the sun produces heat, which is a form of energy. Heat can be trapped in solar panels and the energy can be used elsewhere. The sun is almost always shining, therefore it is a renewable source of energy.
- We are often looking for energy efficiency too, which means that we don’t have to do too much extra work to regulate the temperature inside the building when there are extreme hot and cold temperatures outside the building. In the winter, we want the building to be sturdy so that we don’t have to spend a lot of money and energy to keep the building consistently warm.

The construction industry can look to alternative materials when resource supplies are dwindling or when the materials aren’t able to solve the problems that they need to solve.

Think of a wooden house.

- Where did the wood come from to build that house? What if there are no more trees to cut down for new houses? For these questions you should think about the possibility of recycled and renewable materials.
- Now, think about a place like Florida where there are hurricanes. Are wooden homes strong enough to stand up to the heavy rain and wind? A strong material should be durable and protect the home from natural disasters.
- What happens if lightning strikes the home and a spark starts a fire? Is the material fire resistant?
- Do wooden homes keep the heat in and keep the cold out in the winter? Or would some other material be better for this? If the answer is yes, then the material has good energy efficiency.

Finally, take a look at some building materials and read about their strengths and weaknesses. Use a pros and cons list to analyze the materials from the perspective of sustainability and for the job that needs to be performed.

If it helps to have some examples of these building materials in action, consider showing a video. Scan the QR codes to watch on YouTube or check out others videos at these channels.

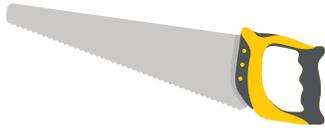


[Straw Bale Studio](#)
[Natural Buildings Channel](#)



[10 Eco-Friendly Building Materials](#)
[Going Green Channel](#)

Tool Safety Worksheet



Cut wood



Make sure a line is straight and flat



Put in or take out a nail



Put in or take out a screw



Apply paint



Dig into the ground



Tighten or loosen something



Measure length



Move heavy supplies

Bring workers up high



SAFETY FIRST!

If personal protective equipment is needed for a particular tool, mark the letters below next to the tool.



Safety glasses to protect eyes

E



Gloves to protect fingers/hands

F



Hard hat/helmet to protect head

H



Mask/respirator to protect lungs

L

Tradesperson Worksheet

Read these brief descriptions of construction industry trades to learn about their day-to-day tasks and responsibilities. Then, team up in groups of 3-5, select which character you'd like to be, and create a five minute skit about how tradespeople work together when building a school. For some added fun, you can do a game of charades to guess each trade.



Sarah is a plumber, which means she installs all of the pipes that bring water to the sinks, toilets, showers, dishwashers, clothes washing machines, and more. Sarah often gets called when a sink is clogged or there are other pipe-related emergencies. Sarah loves meeting new people. Sarah finished high school and went to a special school to be a plumber.

Eve is an electrician, which means they work on everything in a building that has wires! Someone will call Eve whenever lights need to be put up in and around a new construction project, or when there are problems with the lights in an existing building. After high school, Eve had to go to four years of electrician school to get their license. Working as an electrician requires Eve to be very careful so that they do not accidentally get electrocuted.



Ayla is an HVAC technician. HVAC stands for heating, ventilation, and air conditioning. Ayla installs climate control systems like heating and air conditioning, and cooling appliances like refrigerators. Ayla had to attend special schooling and acquire a certification to be able to work as an HVAC technician. Ayla is busy in both the summer and the winter!

Nina is a welder and she uses a heat source to join two pieces of metal together, usually steel. Nina's work is often needed on the inside of buildings and bridges. Nina went to training school that gave her the practice she needed to make sure she could complete her job safely. At the end of her schooling, she took a skills-based test to demonstrate her preparedness. Nina likes working on a part of the project that is important.



Tradesperson Worksheet (p.2)



Hazel is a landscaper. You'll mostly find her outdoors designing yards and gardens for homes, schools, and stores. Hazel loves flowers, trees, and she wants to save the bees! Hazel did not need to attend any special school to be a landscaper, but she learned a lot about plants from her grandmother and that's why she chose this career.

Anissa is a painter, which is perfect for her because she's very creative. Anissa helps people pick out the right color and kind of paint for their projects based on a building's interiors/exteriors. Anissa went to college to study art and decided to become a painter. She helps a lot with the design process for new buildings.



Mercedes is a roofer, meaning she puts the roofs on buildings. This is a dangerous job because she has to be high up in the sky, but she loves the thrill of her work. It can be hot and sweaty being so close to the sun, but Mercedes loves completing one of the last steps of the building and seeing the job done. Sometimes, when there is bad weather, Mercedes can't do her job and she has to wait. Mercedes' dad was a roofer and he got her started in something called an apprenticeship, where she got to try out her job before deciding it was what she wanted to do.

Harper is a carpenter. They love math and problem solving, so when they finished high school they started working in construction! Harper works with wood to build structures, install windows and doors, put in cabinets, and more. There's so much to learn as a carpenter and Harper enjoys doing something new every day.



Sophia is a commercial interior designer, this means she helps direct the design of the inside spaces of public buildings. This includes arranging the space and the furnishings, which are the things that go in the space, like furniture. Sophie specializes in designing spaces for colleges and universities, which can include many types of spaces, like classrooms, cafeterias, gyms, and apartments.

Tradesperson Worksheet (p.3)

If you need some inspiration for skits, try out these scenarios.

Scenario 1

A school is adding on more classrooms at the end of the hall. They are going to first expand the hallway by having a carpenter and roofer add an extra 50 feet of hallway. Then they need an electrician to extend the wires so they can have power and lights in the new rooms. After that, they can bring in someone to add the heating and cooling systems for climate control. Finally, they'll need a painter to paint the new classroom walls.

Scenario 2

At the soccer fields, the school wants to put in bathrooms. They have decided to hire a carpenter to build the structure, then they will need a plumber to make sure they can connect to a water source for toilets and sinks. Next up, they need an electrician to connect the wires from the school out to the fields so they have lights in the bathrooms. When the inside is all done, they are going to hire a landscaper to put in some flowers and bushes near the bathrooms.

Scenario 3

The school needs more storage space and wants to build cabinets to store musical instruments, art supplies, sports equipment, and more. They've decided to hire a welder to make an extra strong frame and a carpenter to design cabinets to fit every different sized item. After that, a painter will come and paint the cabinets with a different design for every room so that each space is unique.