

Think Like an Engineer pt. 4

Overview

Juniors use the Design Thinking Process to design their Take Action project.

Note to Volunteers:

Use The Talking Points (But Make Them Your Own): In each session, you'll find suggested talking points under the heading "SAY." Some volunteers, especially new ones, find it helpful to follow the script. Others use the talking points as a guide and deliver the information in their own words. Either way is just fine.

Be Prepared (It's What Girl Scouts Do!): Each meeting includes a "Prepare Ahead" section that includes a materials list and what kind of set-up is required. Read it in advance so you have enough time to gather supplies and enlist help, if needed.

Use Girl Scouts' Three Processes: Girl-led, learning by doing, cooperative learning — these three processes are the key to making sure Juniors have fun in Girl Scouts and keep coming back.

"Learning by doing" and "cooperative learning" are built into this Journey, thanks to the hands-on activities and tips. You'll also find specific "keep it girl-led" tips in the meeting plans. They'll help you create an experience where Juniors know they can make choices and have their voices heard.

Fail Fast. Succeed Sooner: That's how engineers solve problems. On this Journey, Juniors will learn the Design Thinking Process through hands-on activities. They'll learn to: Brainstorm ways to solve a problem, design prototypes, test them to see what does and doesn't work, then improve their designs. To engineers, failure is a good thing because every time a design fails, you learn something and can make it better.

You can help Juniors think this way. When a Junior's prototype doesn't work, ask questions like, "Why do you think it didn't work? How can you change your design? Try again — that's what engineers do!" This approach also keeps the activity girl-led and fun because Juniors are free to invent things without feeling the pressure to make them perfect.

Leave Time For The Closing Ceremony: If Juniors are having fun doing a Design Challenge, you may be tempted to skip the Closing Ceremony so they can keep going — but the Closing Ceremony is absolutely key to their learning. Here's why:

When Juniors leave a meeting, they'll remember how much fun it was to build something out of cardboard or make a Ping-Pong ball fly across the room. However, they may not realize that they just learned how engineers solve problems or that they're

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good at engineering — unless you tell them.

That's why the Closing Ceremony is so important. It's where you can connect the dots for Juniors by:

- Pointing out how they acted as engineers. (**For example:** They did rapid prototyping. When one of their prototypes didn't work, they saw that "failure" as helpful feedback and tried something else. They worked together to find solutions. They shared their designs and offered suggestions.)
- Reminding Juniors that they are *already* engineers — and that it's fun to solve problems using engineering.
- Letting them know that they have what it takes to continue exploring STEM.

These simple messages can boost Juniors' confidence and interest in STEM — and end the meeting on an upbeat note!

Tell Your Troop Story: As a Girl Scout leader, you're designing experiences that Juniors will remember their whole lives. Try to capture those memories with photos or videos. Juniors love remembering all they did — and it's a great way for parents to see how Girl Scouting helps their Juniors.

And please do share your photos and videos with GSUSA by emailing them to STEM@girlscouts.org (with photo releases if at all possible!).

Program Pairing: The Junior Product Designer badge goes well with this Journey!

Prepare Ahead

- Gather supplies.
- If your meeting location doesn't have a flag, bring a small one that Juniors can take turns holding or hang in the room.

Get Help from Your Family and Friends Network

Your Friends and Family Network can include:

- Juniors' parents, aunts, uncles, older siblings, cousins, and friends
- Other volunteers who have offered to help with the meeting.

Ask your Network to help:

- Bring art supplies.
- Bring a camera, smart phone, or video camera to document the meetings.

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- Assist with helping Juniors create their Take Action project.

Award Connection

Juniors will earn two awards:

- Think Like an Engineer award
- Take Action award

They receive both awards in **Think Like an Engineer PT. 6.**

(Note to Volunteers: You can buy these awards from your council shop or on the Girl Scouts' website.)

Meeting Length

90 minutes

- The times given for each activity will be different depending on how many Juniors are in your troop.
- There is no snack time scheduled in these meetings, but there are 15 minutes of “wiggle room” built in for snacks or activities that run long.
- Give Juniors 10- and 5-minute warnings before they need to wrap up the last activity so you'll have time for the Closing Ceremony.

Juniors use the Design Thinking Process to design their Take Action project.

Materials List

Activity 1: As Girls Arrive: Junior Jumping Jacks

- None

Activity 2: Opening Ceremony: Designing for a Better World

- Flag
- **Design Thinking Process poster**
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Designing Our Take Action Project

- Large pieces of paper or poster boards
- Markers

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- Post-It notes
- Pens/pencils

Activity 4: Closing Ceremony: Ready to Take Action!

- None

Awards

Juniors do not receive any awards in this meeting.

Detailed Activity Plan

Activity 1: As Girls Arrive: Junior Jumping Jacks

Time Allotment

10 minutes

Materials

- None

Steps

Welcome Juniors, and have them do 20 jumping jacks to get energized to start designing their Take Action project.

SAY:

Getting your body moving is one way to boost brainpower because it gets oxygen to your brain and helps improve your thinking.

You'll be doing a lot of thinking today as you design your Take Action project!

Get your brain in gear with some jumping jacks. Let's start with 20. Go!

Activity 2: Opening Ceremony: Designing for a Better World

Overview

Juniors

Time Allotment

20 minutes

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Materials

- Flag
- **Design Thinking Process poster**
- Optional: Poster Board with the Girl Scout Promise and Law

Steps

Recite the Pledge of Allegiance and the Promise and Law.

Conduct any troop business.

Have Juniors look at the **Design Thinking Process poster** and connect the steps to the steps they'll be using to design their Take Action project.

SAY:

Today you'll plan the details of your Take Action project.

What's the first step of the Design Thinking Process? It's listed on this poster. (Answer: Define a need.)

What is the need you've decided you want to solve through your Take Action project?

What's the next step? (Answer: brainstorm and design.)

Even though you have an idea of what you want to do, you need to brainstorm how you're going to do it.

Next week, you'll create what you need to carry out your Take Action plan out. By the end of today's meeting, make sure you have a list of supplies you need.

Activity 3: Designing Our Take Action Project

Time Allotment

35 minutes

Materials

- Large pieces of paper or poster boards
- Markers

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- Post-It notes
- Pens/pencils

Steps

(Note to Volunteers: Stay on schedule so you can hold your Closing Ceremony. Give Juniors 10 and 5-minute warnings before they need to wrap up.)

Brainstorm and Design. (30 minutes)

Depending on the size of the group, divide Juniors into small design teams of 3 – 4 to design their Take Action project.

Offer things for Juniors to think about, depending on what they want to do. For example:

If Juniors want to make a video, how will they film it?

- What do they want to say?
- Do they want to wear costumes?
- Do they want to use music?
- How will they show it to people – at a school assembly, at a gathering of their families, by having an adult post it (safely) online?

If Juniors want to create posters for their school, what materials will they need?

- Who can they ask for permission to put the posters on the walls?
- How should they ask for permission – if they want to make a presentation to the principal, what should they say?
- Once they get permission, what should the posters say?
- What will they look like? When do they want to hang up the posters?
- Do they want to get other students to join them?

The ideas are endless! **Keep It Girl-Led** by giving just one or two examples and then seeing where the Juniors take it.

Remind them that good teamwork is important. Encourage Juniors to take turns, make sure each girl has a role.

Encourage Juniors to write or draw their ideas. Remind them they're designing their Take Action plan. At the next meeting, they will create it.

SAY:

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Is there anything you need to make in order to carry out your project? Is there someone you need to ask for help?

How could you do that? What would you say?

You may need to pave the way for Juniors to Take Action by calling school or town officials to get permission for what they want to do. Or set up a time for Juniors to meet the officials to make their Take Action proposal. If possible, guide the conversation so Juniors come up with ideas about how you can help them so they have the experience of connecting with others to Take Action.

Keep a list of the “to do” items Juniors are suggesting, for example: materials they need, people they need to talk to, etc.

Share and Reflect. (5 minutes)

SAY:

Does anyone remember what engineers do after they've designed something?

(Answer: Share it with others.)

Let's take turns telling the group what you designed.

Give Juniors time to share their ideas.

SAY:

Who else could you share your plan with after this meeting?

Girls may say: family, friends, teachers, neighbors, or classmates.

Be sure to listen to what they say – they may have some ideas to make your plan even better!

Activity 4: Closing Ceremony: Ready to Take Action!

Time Allotment

10 minutes

Materials

- None

Steps

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Have Juniors form a Friendship Circle and share something about their Take Action project design.

SAY:

Let's go around the circle and each shout out one word about how you felt today as you designed your Take Action project.

Give each Junior a chance to say something.

SAY:

Now let's go around the circle in the other direction. Shout out one word about how you think you'll feel next week when you're taking action and making the world a better place!

Go over the list of "to dos" that you have for Juniors to create their Take Action project at the next meeting. (This might be a list of materials Juniors need, a reminder to bring props if they're performing a skit, names of people they need to talk to, etc.)

End the meeting with a Friendship Squeeze.

THE DESIGN PROCESS

Used by engineers, inventors, and other problem solvers, the design process is a series of steps that help people think creatively and come up with solutions.



DEFINE THE NEED



BRAINSTORM



DESIGN



BUILD



REDESIGN



TEST & EVALUATE



SHARE SOLUTIONS



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The Girl Scout Promise

On my honor, I will try:

To serve God and my country,

To help people at all times,

And to live by the Girl Scout Law.

The Girl Scout Law

I will do my best to be

honest and fair,

friendly and helpful,

considerate and caring,

courageous and strong, and

responsible for what I say and do,

and to

respect myself and others,

respect authority,

use resources wisely,

make the world a better place, and

be a sister to every Girl Scout.

Think Like an Engineer Journey

Take Action Guide

What's the difference between a community service project and a Take Action project?

Community Service makes the world better by addressing a problem “right now.” For example, collecting cans of food for a food pantry feeds people “right now.” Gathering toys for a homeless family shelter makes kids happy “right now.” Providing clothing and toiletries to people after a fire or flood helps them “right now.” These acts of kindness are important ways to help people — right now.

Take Action encourages girls to develop a project that is sustainable. That means that the problem continues to be addressed, even after the project is over. Sustainability simply means coming up with a solution that lasts.

For example, girls might want to do something about trash in a local park. If they go to the park and pick up trash, they've solved the problem for today — but there will be more trash to pick up tomorrow.

Instead, girls could explore why there's so much trash. Here's what they might discover:

1. There aren't enough trash cans in the park.
2. The trash cans are hard to find.
3. People have to walk out of their way to throw away trash because of where the cans are placed.
4. People don't realize the importance of putting trash in the trash cans.

Here's how girls might address these issues:

- **Issues 1 – 3:** Make a presentation to the city council to report on their findings and suggest adding more trash cans or moving them to more visible or convenient positions.
- **Issue 4:** Create a public awareness campaign that encourages people to use the trash cans instead of littering.
- **Variation:** Older girls may want to design interactive garbage cans that make tossing your trash fun. Do an online search for “the fun theory” or “the world's deepest bin” to see this in action.

What are the steps of a Take Action project?

Girls team up to:

- Identify a problem
- Come up with a sustainable solution
- Develop a team plan
- Put the plan into action
- Reflect on what they learned

Keep It Girl-Led: Girls should actively participate in each step in order for this to be girl-led. Younger girls will need more guidance, but they can and should decide as a team what problem they want to address.

How do girls make their project sustainable?

Here are three ways to create sustainable change:

1. Make your solution permanent.
2. Educate and inspire others to be part of the change.
3. Change a rule, regulation or law.

How can I help girls come up with Take Action Ideas?

Next are some specific examples you can use to help girls understand what sustainable Take Action projects look like.

Keep It Girl-Led: These examples are intended to give a sense of what a Take Action project could look like. **Please do not choose a project from this list for girls to do!** Instead, guide them to brainstorm ideas, get feedback, and come up with a plan. Girls will learn key leadership skills, such as decision-making, compromise, conflict resolution, and teamwork, when their Take Action project is girl-led.

Engineering/STEM Take Action Ideas

Issue: We could conserve water if more people collected rain water and used it to water plants.

- **Solution 1: Make it permanent.** Make rain collection devices for family or friends that can be installed in their yards. Give them a list of different ways to use rain water and how they're helping the Earth.
- **Solution 2: Educate and inspire others.** Create a handout, video tutorial, or show-and-tell presentation about how to make a rain collection device, how to use rain water and how that helps the Earth.

Issue: More kids need to know that engineering is a fun, creative way to help others.

- **Solution 1: Educate and inspire others.** For show-and-tell, explain what you've learned about how engineers help others, then lead a design challenge activity with your class.
- **Solution 2: Make it permanent.** Partner with a teacher or principal to create an "engineering space" at school where kids can make prototypes and share ideas for new inventions. Put out a call for donations of recyclable materials or cheap prototyping supplies (cardboard boxes, tape, string, paper towel tubes, etc.) to stock the space.

Issue: More people need to know how exciting and fun STEM can be.

- **Solution 1: Educate and inspire others.** Create a list of great books, movies and documentaries that focus on STEM. Make copies for teachers to hand out or make posters for the school library.
- **Solution 2: Educate and inspire others.** Create a short play based on one of the books and perform it for your class or school.

Issue: It's hard for new students to meet people and make friends at school.

- **Solution: Make it permanent.** Design and build "buddy benches." Partner with the school to have the benches installed on the playground so kids who want to make new friends can find each other.

Other Ideas for Take Action

Issue: Parents often run their engines outside the school as they wait to pick up or drop off their children, which pollutes the air.

- **Solution: Change a rule, regulation or law.** Make a presentation to the school board or administrators about why this is a problem and suggest a new rule that makes the pick-up/drop-off area a "no idling" zone.

Issue: There's no sidewalk along a street near the elementary school, which makes it dangerous for children to walk home.

- **Solution: Make it permanent.** Make a presentation to the city council about the problem and suggest that they build a sidewalk. (Note: Even if the council doesn't vote to create a sidewalk, the girls have earned their Take Action award because they came up with a sustainable solution and took action through their presentation.)
- **Extra Inspiration:** Do an online search for "Girl Scout Brownies Convince City Hall to Build Sidewalk."

Issue: There have been several accidents at a busy intersection that doesn't have a stoplight.

- **Solution: Make it permanent.** Research the number of accidents and make a presentation to the city council, asking that they have a stoplight installed.

Issue: The local park doesn't have a swing for children with disabilities.

- **Solution: Make it permanent.** Make a presentation to the city council explaining the problem and offering to use troop money from the cookie sale to help pay for the swing.
- **Extra Inspiration:** Do an online search for "How One Brownie Troop Became Social Entrepreneurs.")

Issue: We should recognize women who have helped their communities and made the world a better place in all kinds of ways.

- **Solution: Educate and inspire others.** Research the "hidden figures" in your community (unsung women who've done great things). Create a display about their accomplishments for a library or community center.

Issue: The local shelter is having a hard time getting rescue animals adopted.

- **Solution: Educate and inspire others.** Use your photography skills to create pet portraits for the shelter's web site. Use your writing skills to craft heart-warming bios for each portrait.

Need more ideas?

Check out [Girls Changing the World](#) on the GSUSA web site. Girls post their Take Action and Bronze/Silver/Gold Award projects on this site. You can search by project topic or grade level. (And after the troop has done their project, please post it so they can inspire other girls!)

33 Ways to Take Action!

Make your solution permanent.

1. Make and install something outside (benches, bird houses, dog run, ropes course, sensory trail for children with disabilities, Little Library, etc.)
2. Plant something (butterfly garden, tree, wind chime garden, etc.)
3. Make something inside (Maker Space, reading room, etc.)
4. Create a collection (children's books children's hospital or family shelter, oral histories for town museum, etc.)
5. Advocate for building a permanent community improvement (sidewalk, bridge, park, streetlights, stoplight, etc.)

Educate and inspire others to be part of the change.

6. Do a show-and-tell
7. Create a poster campaign
8. Perform a skit
9. Make a "how to" handout
10. Draw a comic
11. Give a speech
12. Write and perform a song
13. Make an animated movie
14. Make a live-action movie
15. Make a presentation
16. Create a workshop (perhaps in partnership with a local business or organization) to teach a skill such as coding, camping, canoeing, robotics, sewing, car care, healthy eating, gardening, home repair, budgeting, etc.
17. Create a workshop to teach others about healthy living (exercise, nutrition, mental health, etc.)
18. Create a social media campaign
19. Make video tutorials to teach a skill
20. Organize an email campaign
21. Organize a petition
22. Organize an event (concert, play, poetry slam, art exhibit, sporting event, field day) to raise awareness about an issue
23. Make a "playbook" to help others follow your lead (how to mentor robotics teams, organize a workshop or event, advocate to city council, create an online petition, change a law, etc.)
24. Make an app that helps people take action on an issue
25. Create a web site
26. Write an op-ed or letter to the editor of a newspaper or magazine
27. Start a blog

Change a rule, regulation or law.

28. Make a presentation to your school principal
29. Make a presentation to your school board
30. Make a presentation to your city council
31. Speak up at your representative's town hall meeting
32. Create an online petition
33. Advocate for a law with your state government

Think Like an Engineer Journey

Glossary for Juniors

Juniors may not know some of the words used on this Journey. Here are definitions you can share with them:

Brainstorming means coming up with lots of different ways to solve a problem. You can brainstorm with another person or with a team of people.

Engineers are people who solve problems. They use their imaginations to invent things like self-driving cars. They also come up with new and better ways to build things, such as bridges, buildings, and planes.

A **prototype** is a quick way to show your idea to others or to try it out. It can be as simple as a drawing or it can be made with everyday materials like cardboard, paper, string, rubber bands, etc.

Seismic is something caused by earth's vibrations. It can be caused by nature, like an earthquake, or something artificial, like how the ground vibrates when an airplane takes off.

Think Like an Engineer Journey

Materials List

Think Like an Engineer 1

Activity 1: As Girls Arrive: Engineers Create

- Magazines and catalogs that focus on science and technology or ones that include products, such as cars, devices, architecture, gadgets, etc.
- Scissors

Activity 2: Opening Ceremony: Jump Into Design Thinking!

- Flag
- **Design Thinking Process** poster
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Design Challenge: Paper Structure

- **Design Thinking Process** poster

For each pair of girls:

- Masking or duct tape
- 8 sheets of newspapers
- Four or 5 heavy books
- 1 piece of cardboard (about the size of a piece of copy paper); use it as a platform for the books.
- Twelve-inch ruler to measure height of the structure
- Paper and pencil

Think Like an Engineer 2

Activity 1: As Girls Arrive: Design Like an Engineer

- Paper
- Pens, pencils, markers

Activity 2: Opening Ceremony: Engineers to the Rescue!

- Flag
- **Design Thinking Process** poster
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Design Challenge: Emergency Shelter

- Handout of **Examples of Shelters** (**Note to Volunteers:** Don't show this to until after Juniors have designed their shelter.)

For each team of girls to create a shelter to fit one person:

- 2-4 cardboard sheets (roughly the size of copy paper)
- 16 five-foot bamboo plant stakes or wooden dowels (these are available at garden centers and hardware stores. If unable to find, look for bendable plastic or aluminum rods or poles.)
- 3-4 large garbage bags, cut open into sheets
- Scissors
- Duct tape
- String
- Paper and pencil

(Note to Volunteers: Instead of building a life-size emergency shelter, you can have Juniors create a doll-size shelter and adapt materials accordingly. Optional: Bring dolls for girls to fit inside their shelters.)

Think Like an Engineer Journey

Materials List

Think Like an Engineer 2 (continued)

Activity 4: Closing Ceremony: Brainstorming Our Take Action Project

- List of Juniors' Take Action ideas from Think Like an Engineer 1
- **Take Action Guide**

Think Like an Engineer 3

Activity 1: As Girls Arrive: Shake It Up

- Music from a CD player or another system
- For more fun: Play the song, "Shake, Rattle and Roll"

Activity 2: Opening Ceremony: Choosing Our Take Action Project

- Flag
- List of Take Action ideas from last meeting
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Design Challenge: Pop Fly

- **Ring of Fire map**

For each team of 3-4 girls:

- 20-30 wooden or plastic coffee stirrers (5-6 inches)
- 1/4 lb. modeling clay, Plasticine preferred
- Manila file folder or 8.5 x 11" piece of thin cardboard
- Ruler to measure height of structure
- Pencils and Paper

Volunteer: In advance, make one Shake Table for each team of girls. The directions for "How to Build a Shake Table" is a Meeting Aid.

- 2 pieces of sturdy cardboard (about 8 1/2 by 11 inches)
- 2 thick rubber bands
- 2 tennis (or rubber) balls
- 2 large binder clips
- Ruler or paint stirrer to make a handle
- Masking tape

Activity 4: Closing Ceremony: Shake Dance Contest

- Music

Think Like an Engineer 4

Activity 2: Opening Ceremony: Designing for a Better World

- Flag
- **Design Thinking Process** poster
- Optional: Poster Board with the Girl Scout Promise and Law

Think Like an Engineer Journey

Materials List

Think Like an Engineer 4 (continued)

Activity 3: Designing Our Take Action Project

- Large pieces of paper or poster boards
- Markers
- Post-It notes
- Pens/pencils

Think Like an Engineer 5

Activity 1: As Girls Arrive: Power Poster

- Poster board
- Colored markers

Activity 2: Opening Ceremony: Why is Our Project Important?

- Flag
- **Design Thinking Process** poster
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Creating Our Take Action Project

- Any materials Juniors need for their Take Action project

Think Like an Engineer 6

Activity 1: As Girls Arrive: Get Ready to Celebrate!

- **Girl Scout Promise and Law** poster(s)
- **Design Thinking Process** poster(s)
- Any items Juniors want to display (such as photos or videos from their Take Action project)
- Photos and videos from the Journey meetings
- Music system
- Decorations
- Snacks

Activity 2: Opening Ceremony: Welcome!

- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Awards Ceremony and Celebration

- Think Like an Engineer award
- Take Action award

(**Note to Volunteers:** You can buy these awards from your council shop or on the Girl Scouts' website.)

Activity 4: Girl Survey

- If girls are taking the survey online: Laptop/tablet
- If girls are filling out the survey on paper: Copies of Girl Survey (pdf available in Meeting Aids) and pen or pencil

Brainstorming Tips: Think, Pair, Share

How to Run a Think, Pair, Share Activity:

Tell girls that they're going to brainstorm answers to your question using "Think, Pair, Share."

Lead girls through the basic steps by telling them they will:

1. Break into small groups.

2. Listen to the question or prompt.

3. Think about their answers.

- Girls may want to write their answers down.
- Twenty seconds should be enough time, since girls will need to sit quietly.

4. Pair with other girls.

- Girls talk with one to three other girls (depending on group size), making sure everyone has a chance to share their answers. If there's time, it's OK for girls to ask questions about each other's answers.
- For pairs, 20 seconds should be enough time. If your troop enjoys discussion, consider extending this to 1 to 2 minutes.

5. Share with the group.

- Girls share their answers with the larger group.
- This can be completed in 20 – 30 seconds, but will run longer based on group size and how the group sharing is done.

There are two ways to set up group sharing:

- **Strongly Recommended:** One girl shares the best/most interesting/summary answer for the group. This approach is great if you're running short on time. It also helps develop conflict resolution and compromise skills.
- **Optional:** Each girl shares her partner's answer. This helps girls develop active listening skills, but will run longer because all girls are sharing.