

Spring 2019

# Engineering Explorers Club

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NEBRASKA HONORS PROGRAM  
CLC EXPANDED LEARNING OPPORTUNITY CLUBS  
INFORMATION SHEET

**Name of Club:** Engineering Explorers

**Age/Grade Level:** K-5

**Number of Attendees:** (ideal number) 5-20

**Goal of the Club:** (learning objectives/outcomes)

Introduce engineering concepts and fields / Practice using the engineering design process and teamwork

**Resources:** (Information for club provided by)

Pinterest ideas/CLC curriculum

**Content Areas:** (check all that apply)

- Arts (Visual, Music, Theater & Performance)
- Literacy
- STEM (Science, Technology, Engineering & Math)
- Social Studies
- Wellness (Physical Education, Health, Nutrition & Character Education)

**Outputs or final products:** (Does the club have a final product/project to showcase to community?)

Various projects each week

**Introducing your Club/Activities:**

The Engineering Explorers club introduces students to the basics of engineering while giving them practice with teamwork and problem solving.

**General Directions:**

Engage students in hands on activities to teach the basics of engineering, teamwork, and problem solving.

**Tips/Tricks:**

Have at least two club leaders to help activities run smoothly.

Adjust the difficulty of the activities for different age groups.

Don't hesitate to have them draw out their ideas on paper before giving out materials.

Choose whether working in groups or individually will be best for the students.

# LESSON PLAN WORKSHEET

(copy table as needed)

**Lesson Activity**                      Introducing the Engineering Design Process

**Name:**

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**Length of Activity:**                45-60 minutes

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**Supplies:**                              Paper and writing utensils

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**Directions:**

Explain that engineers work to solve problems in the world every day. Say that when they're presented with a problem, they use the engineering design process to solve it. Tell the students that today they will be starting with the first step which is brainstorming even ideas that seem strange. Let the students come up with the problem they want to solve and then set them loose to brainstorm.

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**Conclusion of the activity:**

Bring the group back together to discuss the ideas they came up with. Talk about why a group of engineers might start working on their project by brainstorming this way. Briefly give an overview of the rest of the process that an engineer would go through. If time allows have the students use crafting materials to make a model of their idea.

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**Parts of activity that worked:**

The students really enjoyed coming up with silly ideas. They also liked making models of their ideas.

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**Parts of activity that did not work:**

Some younger students did not go as far into brainstorming as others which made it a less interesting activity for them.

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# LESSON PLAN WORKSHEET

(copy table as needed)

**Lesson Activity** Paper Airplanes

**Name:**

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**Length of Activity:** 60 minutes

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**Supplies:** Paper

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**Directions:**

Ask students to make the best paper airplane they can. Give them a chance to test how far it will fly. Bring the students all together to explore a few chosen paper airplane designs. Fold different paper airplane designs together. Give students the chance to test all of their planes and make observations.

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**Conclusion of the activity:**

Demonstrate each airplane design flying for all students. Discuss their flight. Which flew the farthest? Did any of them spin or flip? Did any take a nose dive? Discuss why the designs made the planes fly like they did.

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**Parts of activity that worked:**

Students stayed engaged as they wanted to have their paper airplane fly the farthest.

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**Parts of activity that did not work:**

Getting to leave the classroom made younger students a little bit rowdy. Some students had difficulty making the folds.

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# LESSON PLAN WORKSHEET

(copy table as needed)

**Lesson Activity** Building Towers

**Name:**

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**Length of Activity:** 60 minutes

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**Supplies:** Masking tape and paper

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**Directions:**

Ask students to tell you about the tallest building they've ever seen. Talk a little bit about those buildings with them and then introduce them to other tall buildings. A fun one to do is the Leaning Tower of Pisa! Tell the students that their groups will be trying to build the tallest tower that they can and that they can even try to make it lean if they want to. Give them a time limit.

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**Conclusion of the activity:**

Once time is up let each group present their tower. Ask them about what they did to make it stand and about where they got the idea from. Point out what you see that they did well that helped make the tower stand.

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**Parts of activity that worked:**

The students were very excited to see how tall they could make their tower. To keep the towers standing teamwork was required so no one tried to work on their own.

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**Parts of activity that did not work:**

Some of the students really wanted to knock other teams' towers down.

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# LESSON PLAN WORKSHEET

(copy table as needed)

**Lesson Activity** Understanding Gravity

**Name:**

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**Length of Activity:** 45-60 minutes

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**Supplies:** Balls, paper, notebook, grocery bag, and paper clips (any droppable objects)

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**Directions:**

Ask students to recall the last two weeks of activities: paper airplanes and building towers. In one activity they were trying to keep something in the air for as long as possible and in the other they were trying to keep something from toppling to the ground. Ask if anyone knows what might be drawing objects down to the Earth. Introduce the concept of gravity by demonstrating with the supplies you have. You can use the grocery bag as a parachute for a paper clip to introduce air resistance as well. The key is to let them see how different objects fall to the ground and to give them a basic idea of gravity.

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**Conclusion of the activity:**

Give the students pencils and paper to come up with their own invention that has to do with gravity. It could be an interesting 'gravity defying' building, a flying object, or something to slow gravity down. Interact with them while they're working to hear about their ideas and continue the discussion of gravity.

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**Parts of activity that worked:**

They enjoyed making their designs and explaining them.

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**Parts of activity that did not work:**

It was hard to hold the attention of younger students for the demonstrations. Having them come up front to help with demonstrations helps keep them focused.

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# LESSON PLAN WORKSHEET

(copy table as needed)

**Lesson Activity** Strongest Table

**Name:**

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**Length of Activity:** 60 minutes

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**Supplies:** Paper, masking tape, and books

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**Directions:**

Quickly review what gravity is. Tell students that now that they understand gravity, they need to use their knowledge to keep as many books in the air as possible. Give them some hints about what kinds of shapes make a strong design. Give them a time limit.

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**Conclusion of the activity:**

Once time is up test all of the tables by stacking books onto them. Ask the groups to present their tables and the ideas they put into them to make them stand strong.

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**Parts of activity that worked:**

The activity got the students thinking about the functionality of what they were building.

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**Parts of activity that did not work:**

The students got too competitive at times and attempted to destroy other team's projects.

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# LESSON PLAN WORKSHEET

(copy table as needed)

**Lesson Activity** Bridging the Gap

**Name:**

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**Length of Activity:** 60 minutes

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**Supplies:** Straws, popsicle sticks, masking tape, and scissors

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**Directions:**

Ask the students if they know what a bridge is. Describe what a bridge's function is and show some pictures to help them understand. Tell them that they will be designing a bridge to help connect two tables separated by a 'ravine'. Give time to draw out designs so they can choose what materials they need. Give a time limit for building the bridges.

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**Conclusion of the activity:**

When time is up, have the students present the bridges that they built. Ask them about the design that they chose. You can even try putting a little bit of weight on the bridges to see if they can hold up. Discuss why their designs did or did not work to bridge the gap.

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**Parts of activity that worked:**

Students got very creative with their bridge designs. Some of them even shared deeper meanings of their design.

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**Parts of activity that did not work:**

A surprising number of students did not know what a bridge was and didn't quite understand what they were supposed to be making.

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# LESSON PLAN WORKSHEET

(copy table as needed)

**Lesson Activity**                      Whatever Floats Your Boat

**Name:**

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**Length of Activity:**                60 minutes

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**Supplies:**                            Popsicle sticks, straws, masking tape, tin foil, wax paper, scissors, and a tub of water

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**Directions:**

Ask the students what they know about boats. Talk about the functions boats serve and show some pictures of the different types of boats that exist (sailboats, canoes, cargo ships, etc.). Tell the students that they are tasked with designing a boat that can float on water and that can hold an object. Make sure they know that at the end their boat will be put to the test.

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**Conclusion of the activity:**

Have each student bring up their boat to the tub of water to be tested. First see if it floats and then try adding a little bit of weight to see if it still holds up. Engage the students in discussion about why their designs did or did not float.

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**Parts of activity that worked:**

The students were very excited to actually see their boats float on water.

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**Parts of activity that did not work:**

The students tried to play in the water so you need to be sure to have control over the tub.

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# LESSON PLAN WORKSHEET

(copy table as needed)

<b>Lesson Activity Name:</b>	Cars
<b>Length of Activity:</b>	60 minutes
<b>Supplies:</b>	Food boats, cardboard, straws, tin foil, wax paper, scissors, and masking tape

## **Directions:**

Ask the students what they know about cars. Talk about how cars are designed to be aerodynamic and discuss what this means. Tell the students that they will be designing their own cars and that they want them to roll as far as possible. This means thinking about making the car aerodynamic. Give the students a time limit.

## **Conclusion of the activity:**

Once all of the cars are built have the students do one final test for distance. Then have the students present their designs. Have them talk about what they did to make the car roll as far as possible.

## **Parts of activity that worked:**

Most students were interested in cars so they thought it was fun to build their own.

## **Parts of activity that did not work:**

Students struggled quite a bit with the concept of making an axle for the wheels to be able to spin.

# LESSON PLAN WORKSHEET

(copy table as needed)

**Lesson Activity** Electricity

**Name:**

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**Length of Activity:** 60 minutes

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**Supplies:** Snap Circuits

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**Directions:**

Have stations set up with pieces and instructions for various circuit projects from a snap circuit kit. Put students into groups at the different stations. Have them build the circuits together. Make sure to engage with the students while they are working to help them understand what they are building and why it does what it does. After they are done at one station have them rotate to the next for a new project.

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**Conclusion of the activity:**

Ask questions related to what you observed the students doing. Answer their questions about the circuits and electricity. Help them build a better understanding of what they put together.

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**Parts of activity that worked:**

The circuits we chose for them to build had fun end results that they enjoyed. For example, they had a good time using the 'lie detector'.

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**Parts of activity that did not work:**

Many of the students had a hard time understanding why the parts they were putting together did or did not make their circuit work.

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