

Part 1

Design and Technology Building Project Timeline

Picture frame with a pivoting foot stand

To introduce the Design and Technology project, you want your students to learn the basics of building. To do so, we are going to start by building a picture frame with a pivoting foot stand.

- How to design and sketch a model on graph paper.
- How to measure, cut, drill and glue basswood strips and dowels.
- How to add strength to structures with gusset corners and backing.
- When to use hot glue versus white or wood liquid glue.
- How to safely use the different tools required for these projects.

The time required depends on students' background knowledge, skills set, level of interest and any additional time required for the completion of the students' projects. I suggest the number of 40-minute periods you might consider using for each step.

Material:

- 2 to 3 [pieces of basswood](#) per students (1 cm x 1 cm x 61 cm)
- [Dowels](#) 4 mm or 5 mm (skewer from the grocery store works well).
- Rulers
- [Hand Drills](#)
- [Basic Hacksaws](#)
- [Low Temperature Glue guns](#)
- Glue sticks
- White or Wood Glue

- Rigid plastic placemats to place under the work area of the glue guns
- [Vise grips](#)
- [Mitre Box](#)
- [Clamps](#)
- [Gusset Corners](#)
- Cardstock or [foam board](#)
- [Paper straws](#)
- [Pony beads](#)
- [Screw eyes](#)
- [Small wheels](#)
- small nails
- [nail guide](#)
- [small hammers](#)
- Safety Goggles
- Gloves (garden or cotton work gloves)
- [Kidder Mitre Cutter](#)

Guiding Question: How can I build a strong structure (frame) to help support my playground equipment?

How to design a model using 1 cm graph paper.

Making a picture frame to learn the basics.

<p>Step 1</p>	<p><u>Make a sketch of the wood frame</u></p> <ul style="list-style-type: none"> - Start by drawing a 15 cm by 10 cm rectangle using the blue lines of the graphing paper and a ruler.
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1 - 2 periods

Pre-requisite:

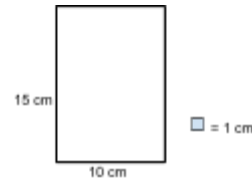
Students need to know what perimeter is.

Material:

- One 61 cm x 1 cm x 1 cm basswood strip per students.
- rulers
- pencils
- grid paper

Assessment opportunity:

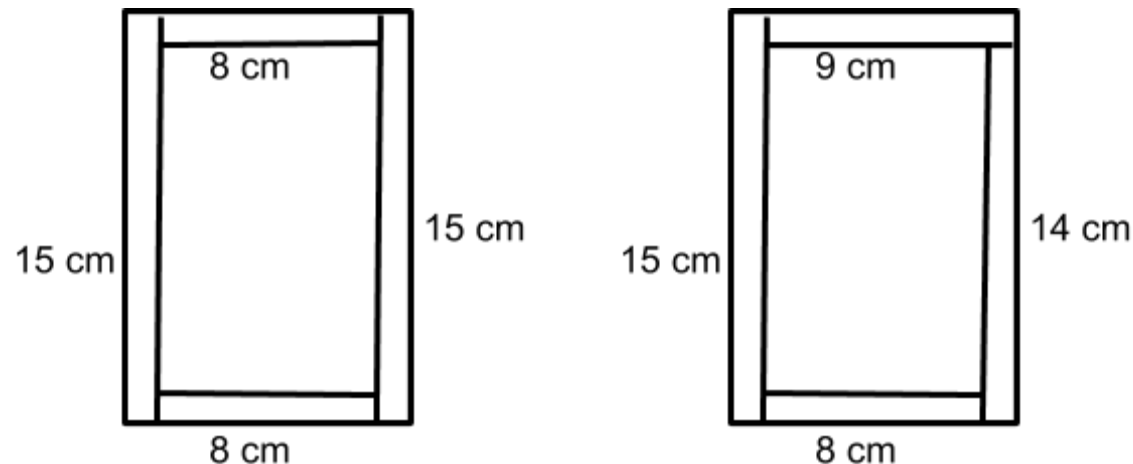
- The student can draw a rectangle of the correct perimeter dimensions. (See assessment doc)

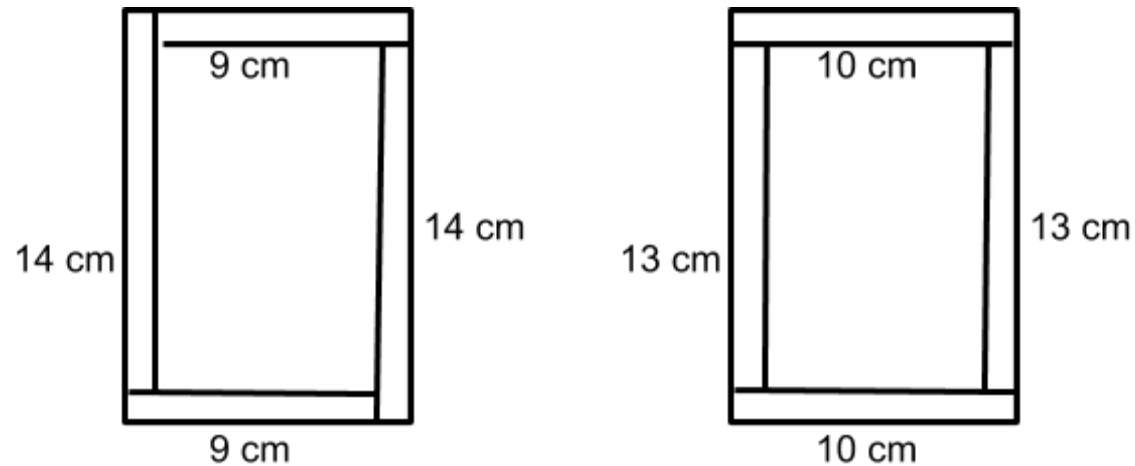


★ Classroom Tip:

Take the time to have students compare the strip of basswood against the blue squares of the grid paper so they understand the grid squares are as big as the pieces of wood they will use. They should also draw a legend: 1 square on the graphing paper equals the thickness of the basswood strip.

- Determine how long each of the wood pieces must be to build the frame by drawing the pieces on your plan. There are different configurations possible. Some students may benefit from using 1 cm snapping cube manipulatives to determine the length of each piece of wood.





This step may take a while for students to figure out (how long each piece can be).

★ Classroom Tip:

Letting them struggle with this step is important. Refrain from jumping in and provide solutions. Rather, ask guiding questions that will help them problem solve. They will be much more satisfied and gain confidence if they figure it out on their own.

Step 2

2 - 3 periods

I highly recommend that you invite parent volunteers.

Safety discussion

About using saws, mitre box, clamps, drills, hot glue guns, googles. See **Safety Considerations document**.

You can also find the [STAO Elementary Safety Guide here](#).

Measure and cut

Using one 61 cm x 1 cm x 1 cm strip of basswood, measure and clearly mark each piece

Pre-requisite:

Students must know how to accurately use a cm ruler.

Material:**Each student must wear goggles****Station 1:**

- 4 glue guns
- Glue sticks
- 4 pairs of gloves
- 4 rigid plastic placemats
- 4 scrapers
- 1 power bar extension

Station 2:

- 4 saws
- 4 mitre box
- 4 table clamps

Station 3:

- 4 Vise Grips
- 4 hand drills
- 4 drill bits (a little wider than your dowels)

Assessment opportunity:

- The student accurately measures the length of the

for your frame using a ruler. Also write the measurement directly on each piece as well as your name. Do the same for the extra length of your strip which you will use later. "Measure twice, cut once". Using a saw, cut your pieces. Glue your frame according to your plan.

☆ Classroom Tip:

You might want to consider cutting their basswood strip yourself with a mitre cutter (snips) and let them use the saw for their next project steps.

At the glue gun station, have students place their design plan on the placement and place their strips of basswood on top. This will help them glue their pieces in the right positions.

You might consider setting up a workstation for each tool:

Station 1:

4 glue guns, 4 rigid plastic placemats, 4 scrapers to clear the glue off the placemats, glue sticks, an extension to plug in the glue guns.

Station 2:

4 saws, 4 mitre boxes, and 4 table clamps

Station 3:

4 Vise Grips, 4 hand drills

pieces as per their plan using a cm ruler.

- The student can explain why each piece of wood is the size that it is and creates a 15 x 10 cm perimeter.

- The student follows safety rules while using tools.

- The student evaluates his design and modifies accordingly.

Step 3

1 period (Step 3 and 4)

Material:

4 stations of:

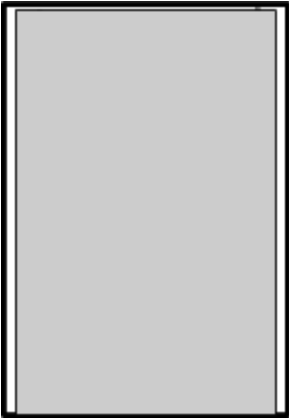
- Gusset corners
- Cardstock or foam board
- white or wood glue

Reinforcing our structure

To reinforce the structure of your frame, glue gusset corners on one side of your frame using white glue.



Gusset Corners

<ul style="list-style-type: none"> - scissors - Plastic mats or tablecloths <p><u>Assessment opportunity:</u></p> <ul style="list-style-type: none"> - The student evaluates his design and modifies accordingly. 	
<p>Step 4</p>	<p>On the other side of your frame, add cardstock (or foam board) to fully cover the back. Glue against the frame with white glue or wood glue.</p> 
	<p>Let dry overnight.</p>

Step 5

2 periods (Steps 5 to 9)

Material:

Each student must wear goggles

Station 1:

- 4 glue guns
- Glue sticks
- 4 pairs of gloves
- 4 rigid plastic placemats
- 4 scrapers
- 1 power bar extension

Station 2:

- Plastic or paper straws
- scissors
- Pony beads

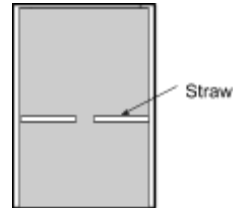
Station 3:

- Dowels
- 4 saws
- 4 mitre box
- 4 table clamps

Station 4:

Add a foot stand for your picture frame.

At the back of your frame (the side with the cardstock), measure a piece of straw 9 cm long. Cut in half. With a glue gun, glue both pieces in a straight line on the cardstock leaving 1 cm gap in the middle.



- 4 Hand drills
- 4 Vise grips

Assessment opportunity:

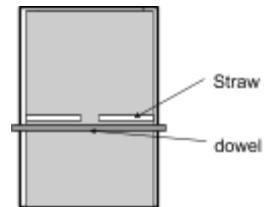
- The student evaluates his design and modifies accordingly.

Step 6

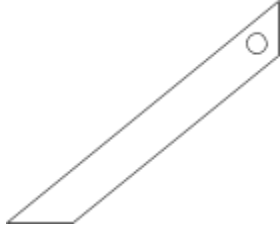
Building the foot stand

Now that your glue on the gusset corners and the cardstock (or foam board) is dry...

- Measure a piece of dowel that will go through the straws. It will need to be long enough to stick out on each side of your frame, enough to place a bead on each ends to prevent the dowel from slip out but still allowing the dowel to rotate inside the straw.



- Cut a small strip of basswood which you will use as a stand foot for your frame.
- Decide how long you want it to be depending on the angle you want your frame to

	have.
Step 7	<ul style="list-style-type: none"> - Cut both ends (or only one) of your foot stand at a 45 degrees. - Drill a hole at the end of your foot stand where it is cut at 45 degrees. 
Step 8	<ul style="list-style-type: none"> - Slide the dowel into one straw, place the foot stand in the gap between the straws, push the dowel through your foot stand, and into the next straw.
Step 9	<ul style="list-style-type: none"> - Place a bead of hot glue on each end of your dowel and place a bead at each end. - Take care not to touch the straw with the glue. The dowel must move freely inside the straw. - Place a bead of hot glue on each side of your foot stand so that it is glued to the dowel. - Again, make sure not to get glue on the straws.
Step 10 1 period	<p><u>Decorating the foot stand</u></p> <ul style="list-style-type: none"> - Students can decorate their frames with paint or felt markers. - You can take a picture of each student and print them. - Students cut the pictures to fit inside the frame.

Part 2

Design and Technology Inquiry Timeline

Simple machines - Strong and Stable Structures - Introduction lessons only. Full investigation and learning of these strands will need to be done prior to this project or after.

Guiding Questions: What are simple machines and what do they do? What are strong and stable structures?

Step 1 1 period <u>Material:</u> Chart paper Markers Students science notebooks	<u>What are simple machines?</u> - Start by asking students if they know what simple machines are. - Introduce the inclined plane. <ul style="list-style-type: none">• How do we use this simple machine?• Can you find a real-life example of this simple machine?• How does it help us?• How can you define a simple machine? - Introduce the six types of simple machines. Sketch them on a chart paper. Label them. <ul style="list-style-type: none">• Lever (Le levier)
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- Wheel and axle (La roue et l'essieu)
- Pulley (La poulie)
- Inclined plane (Le plan incliné)
- Wedge (Le coin)
- Screw (La vis)

- Discuss each type.

- How do we use this simple machine?
- Can you find a real-life example of this simple machine?
- How does it help us?

- Have students draw each simple machines, label it, and give a real-life example of each simple machines.

There are many videos on youtube to demonstrate the simple machines and how they can be used.

This is a limited exploration of this strand (Simple Machines) but enough to prepare them for this building project.

What are strong and stable structures?

- Start by asking students to give you examples of structures.

- How do we use structures?
- Can you name structures that are around us?

- As students to give examples of structures, write them down on an index card.

- With the help of the students, categorize the structures as **man-made structures** and **found in nature**.

	<p>- Add more examples of the two categories.</p> <ul style="list-style-type: none"> • How do they help us? • What function do they serve? • How can you make a structure strong and stable? <p>There are many videos on youtube to demonstrate strong and stable structures.</p> <p>This is a limited exploration of this strand (Structures) but enough to prepare them for this building project.</p>
<p>Step 2</p> <p>1 period</p> <p><u>Material:</u></p> <ul style="list-style-type: none"> - Clipboard for each student - Paper and pencil - iPads or similar devices to take pictures <p><u>Assessment opportunity:</u></p> <ul style="list-style-type: none"> - The student recognizes simple machines during the exploration of the playground. 	<p><u>Let's go outside investigate if we can find simple machines in our school play structure</u></p> <ul style="list-style-type: none"> - Lead your class outside to your playground where there is a playground structure. - Encourage students to look around to find evidence of simple machines and structures that are strong and stable. - When they find one, they sketch it on their paper. - Once back inside, students label each sketch with both the name of the simple machine used and the name of the playground equipment (example: a slide, an inclined plane)

<p>- The student recognizes structures during the exploration of the playground.</p>	
<p>Step 3</p> <p>1 to 2 periods</p> <p><u>Material:</u></p> <ul style="list-style-type: none"> - Graph paper - Technological Design Process worksheet 	<p><u>Let's decide which play structure you want to build.</u></p> <ul style="list-style-type: none"> - Students brainstorm a few playground structure idea they would like to build. - Then they choose one and sketch it on a piece of graph paper until they are satisfied it contains all its parts. - Their design must be sketched the size they are going to build it using the 1 cm graph paper. I recommend that the high of their structure does not surpass 15 cm. - Students use the Technological Design Process worksheet and fill in sections 1 to 4.
<p>Step 4</p> <p>2 to 4 periods</p> <p>I highly recommend that you invite parent volunteers.</p> <p><u>Material:</u></p> <p>Each student must wear goggles</p> <ul style="list-style-type: none"> - 1 to 2 pieces of basswood 	<p><u>Students start building and problem-solving their design.</u></p> <p><u>Review Safety considerations prior to starting building.</u></p> <ul style="list-style-type: none"> - Students start making the pieces for their play structure. - As they build their structure, they experiment with ways to make their structure work the way it is intended. - Grade 3 should be expected to build the structure that supports 2 - 3 playground equipment as a larger play structure.

strip per students

Station 1:

- 4 glue guns
- Glue sticks
- 4 pairs of gloves
- 4 rigid plastic placemats
- 4 scrapers
- 1 power bar extension

Station 2:

- 4 saws
- 4 mitre box
- 4 table clamps

Station 3:

- 4 Vise Grips
- 4 hand drills
- 4 drill bits (a little wider than your dowels)

Station 4:

- Plastic or paper straws
- Scissors
- Gusset corners
- Cardstock or foam board
- Rulers
- White or wood glue
- Pony beads
- Plastic Pulleys
- Small wheels
- Dowels

- String
- Screws eyes
- Small nails
- Nail guide
- Small hammers
- Pipe cleaners

Assessment opportunity:

- The student accurately measures the length of the pieces as per their plan using a cm ruler.
- The student applies the building techniques learned during the Picture Frame Project.
- The student evaluates his or her design and modifies it accordingly.
- Use the assessment doc for more detailed assessment points.

Step 5

Students finalize their playground structures.

- Students finalize their playground structures.
- Students fill out the Technological Design Process worksheet section 5 to 7.