SEE THE POTENTIAL:
WOOD INNOVATIONS FOR THE CLASSROOM

K – 12 RESOURCE FOR ADST PROJECTS

skills READY

SEE THE POTENTIAL

From found wood, to pieces milled for sale in the local hardware store, any new creation starts with an idea. The project guidelines contained within this book have been created to inspire students to learn new skills and expand their minds to create new things. We believe that if you show someone what is possible, they will find a way to make it a reality.

FOR ADDITIONAL INFORMATION VISIT: PROJECTS.SKILLSREADY.CA

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Technology Device Holders

From workability to acoustic qualities, the myriad characteristics of B.C. wood allow makers, teachers and students to choose the perfect material for their job. Learning how to identify and select the appropriate material or wood product to work with is an integral part of the B.C. Curriculum.

NOVICE

Tablet Stand

The tablet stand is a good project for the beginner builder and pine is the wood of choice for its low relative price as well as its workability. Students might be interested to discuss the differences between softwood and hardwood, and why pine would be a good choice to use.

INTERMEDIATE

Animal Phone Stand

Douglas fir is chosen for the intermediate project, the animal phone stand, because of its tight/straight grain (resistance to warpage) and its ability to resist splitting when fasteners are applied. Students may also be interested to research the grain designs of this wood and choose a clear finish to show off their piece.

ADVANCED

Passive Phone Speaker

For the advanced project, the passive phone speaker, students could research the acoustic characteristics of locally available Sitka spruce, Western red cedar, and maple, and make selections for their project based on the results of their research. The option to customize this speaker for a specific phone adds an element of design planning to the project.

CAREER BITE

Paul Bates

Paul Bates is a shipwright and marine repair technician with over ten years of experience designing, building, repairing and restoring boats of all makes and models. Most recently he has been working on a marine project which seeks to lower environmental impacts. The project includes the creation of electric boats, that maintain the beautiful, old look of an original craft and integrate it with newer technology that will keep CO2 emissions and fuel costs down.

batesmarine.com

What did you do in high school that connects to your career as a Shipwright?

In high school I did not take formal woodworking courses, my mom taught the women in trades and technology program at the local college and showed me how to use all types of woodworking machines and tools. This combined with taking machine shop class and automotive/welding in high school piqued my interest in aircraft mechanics. I took a co-op class (cooperative education) at an airport, which allowed me to assist in the restoration on a World War 2 training biplane called a Stearman, it had wings made of oak (wooden) with fabric wrapped around them and an aluminum fuselage which was also wrapped with fabric. It was a full restoration which took a little over 8000 hours.

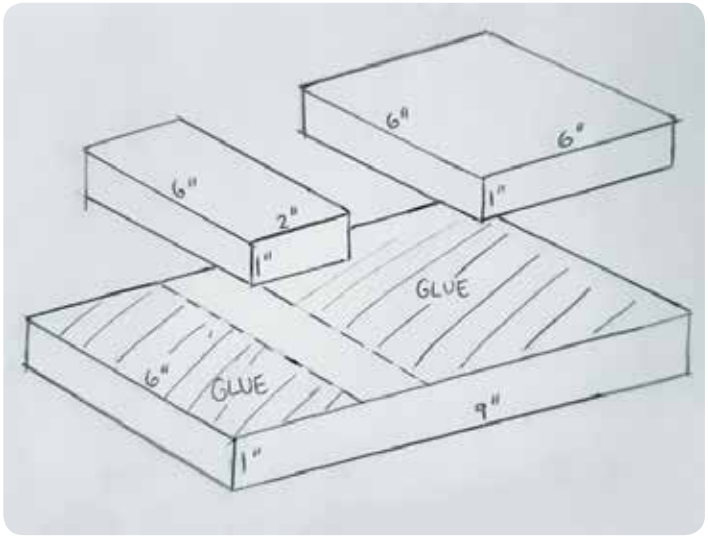
What training or jobs did you complete previously that led to this career?

After high school I got into the film industry and built props and sets for different movies and commercials along with many short films. I did a lot of woodworking and painting, making big facades and props using a variety of wood products. I really enjoyed making things out of wood mainly because you can make almost anything out of it!

I really loved being by the water, so when I was offered a job working with boats I was in there! I started as a mechanics assistant and then accepted an opportunity to work with wooden boats. I then attended courses at Quadrant Marine Institute which helped me gain a ton of useful knowledge about all aspects of boats, from fibreglassing and painting to mechanical and woodwork. This is a Red Seal program with amazing teachers.

What part of working with wood inspires you?

I love working on old boats and building new wooden boats — it is a privilege to see decades of old work come back to life. I endeavour to retain traditional practices and integrate new concepts to inspire others to keep up the old beauty with a new touch. We use many different species of wood to create a boat — from oak frames to fir and cedar planking that is found here in BC. We also use mahogany and numerous other woods found in different places around the world. Wooden boats have a story to tell — hidden in the intricate woodwork, grain and hours of thought and planning behind each placement and component.



Tablet Stand

NOVICE

APPROXIMATE TIME: 2 1-HOUR CLASSES

TOOLS & MATERIALS

MATERIAL LIST

- SPF (Spruce, Pine, Fir) 1"x 6" x 20" long
- Water based stain or vegetable oil – other finishes such as felt pen/pencil crayon would also allow for student design and personalization.
- Wood glue

TOOL LIST

- Sandpaper (increasing grits) – start with 80 and work up to 220
- Sanding blocks
- Tape Measure
- Speed square
- Clamps
- Coping saw or small hand saw

PROCEDURE

1. Gather materials and tools.
2. Using the tape measure and speed square carefully measure out all pieces using the CUT LIST:
    - One ¾" x 5 ½" x 9"
    - One ¾" x 5 ½" x 2"
    - One ¾" x 5 ½" x 6"
3. Clamp your material to a table and begin cutting out each of your laid-out pieces. Ensure your saw will not cut into your table and is clearly free of any other obstacles.
4. Sand each of your pieces using sandpaper and a sanding block. Be sure to remove any rough edges.
5. Spread wood glue along the faces of the two smaller pieces, and glue onto the large piece as diagrammed. Match the long ends and leave a 1" gap (this is where the tablet rests). Clamp and allow to dry. Wipe away any excess glue using a damp paper towel.
6. Once your glue has dried (at least 1 hour), remove the clamps. Sand your project using sandpaper and blocks. Sand in the direction of the grain. Start with the 80 grit and move up to the 220 grit until smooth.
7. Apply your water-based stain, or alternate finish.

EXTENSION CHALLENGES

1. Play with angling the sides of the cut using a mitre box and hand saw.
2. Customize the width of the stand for a specific tablet, or for either portrait or landscape arrangements.
3. Use a paint finish and customize a design on the large face in a contrasting colour.
4. Create a design on the large face using a wood burner or small rotary tool (Dremel).

Animal Phone Stand

INTERMEDIATE

APPROXIMATE TIME: 3 TO 4 1-HOUR CLASSES

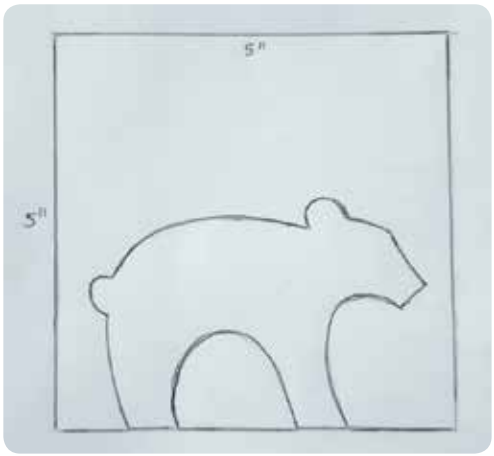
TOOLS & MATERIALS

MATERIAL LIST

- 2 – 1" x 6" x 5 ½" - Douglas fir
- Water based stain or vegetable oil – other finishes such as felt pen/pencil crayon would also allow for student design and personalization
- Wood glue
- 2 – #8 x 1 ¼" wood screws

TOOL LIST

- Safety glasses
- Straight edge/ruler
- Compass
- Coping saw, bandsaw or scroll saw
- Router table with ½" half round router bit
- Cordless drill - with #8 Robertson driver bit, ⅛" drill bit and ⅜" countersink
- Clamps
- Sandpaper 80 – 220 grit
- Sanding blocks

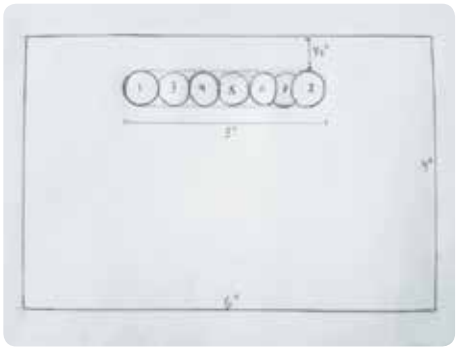


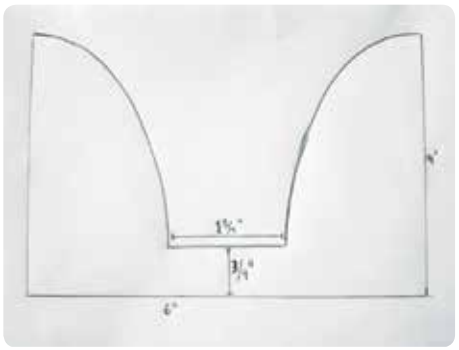
PROCEDURE

1. Using a blank piece of paper, draw a 5 ½" square.
2. Within your square, draw your chosen animal – This should be a simple outline as noted in the image to the left.
3. To make the base, use a table-mounted router with fence and a ½" core box (half-round) router bit. Be sure to wear your safety glasses. Set the fence ½" from the edge of the bit and cut a ⅜" deep groove on the edge of one of the 5 ½" square pieces. **This should be done with teacher supervision**
4. Find the center of the base. To do this use a straight edge and draw diagonal lines between corners, forming an "X". Where the two lines intersect is your center location. Using a compass, draw a circle with a 2 ½" radius.
5. Cut out the round shape base using a bandsaw or coping saw. Sand your piece to remove any rough edges.
6. To make the vertical animal stand — Cut out a photocopy of your design and use a glue-stick to attach the paper to the second 5 ½" square piece of wood. Make sure the "feet" or pieces that will rest on the base are flush at the edge of the square. This will ensure they remain straight.
7. Using a bandsaw or coping saw, cut out your animal shape. Sand your piece everywhere except the bottom of the feet.
8. Place the animal on the base so that the animal is perpendicular to the phone rest trough. Locate the forward edge of the front feet within ½" of the far edge of the base circle. Make some light pencil marks on all four sides so you can see where to drill your holes and place the animal when you are ready to glue.
9. Drill a ⅛" hole through the base where the animal feet will be located. (center of foot)
10. From the underside of the base, use a ⅜" countersink drill bit and drill a countersink hole so it leaves a dimple in the wood, to ensure your screw is flush with the bottom.
11. Spread glue on the base of the animal and set onto the base.
12. Using the #8 Robertson driver bit, screw in 1 ¼" screws to secure your animal firmly to the base.
13. Wipe away any excess glue with a damp cloth.
14. Apply wood stain or paint to your finished piece.

EXTENSION CHALLENGES

1. Experiment with a no-fastener design, where the support fits into the base using different joinery techniques and is removable for flat storage.
2. Design a more complex 3-D support (for example — two 2-D figures interacting, or by turning a shape on a lathe etc.
3. Woodburn details onto your animal.





Passive Phone Speaker

ADVANCED

APPROXIMATE TIME: 4 TO 6 1-HOUR CLASSES

TOOLS & MATERIALS

MATERIAL LIST

- Assorted wood types available in a variety of sizes. Top and bottom pieces should be ½" thick. Middle piece should be 1 ½" thick
- Wood glue

TOOL LIST

- Safety glasses
- Straight edge ruler
- Bandsaw
- Chop saw
- Scroll saw
- Drill press with ½" Forstner bit
- Scrap wood for drill press and fence
- Assorted wood files
- Clamps
- Sandpaper (# grits)
- Sanding blocks

PROCEDURE

1. Cut your top and bottom pieces to 6" x 4" x ½" using the bandsaw or chop saw.
2. On your top piece, you will drill a series of ½" holes as seen in the image on the left. They should be ½" away from the back of the long edge and 1 ½" from the sides. Be sure to drill enough holes to custom fit your device.
3. You will need to locate the center of the two outside holes first. Measure ¾" in from the back edge of the board and 1 ¾" from each side. Along with a drill press and a scrap piece of wood (to clamp on as a straight edge), a ½" Forstner drill bit will be used to drill your holes. Continue drilling holes next to each other to hollow out the phone slot.
4. Clamp the top piece down (or use a vice) and use a wood file to clean up the edges to create straight uniform edges, leaving the ends of the slot round. Once the filing is complete, lightly sand to remove any further rough areas.
5. Sketch the shape shown to the left onto your inner 1 ½" thick piece. Cut out with a bandsaw or scroll saw.
6. Sand the curved sides before assembly. Do not sand the top and bottom faces that will be glued.
7. Spread glue on the top and bottom of your inner piece and place the top and bottom of your speaker together like a sandwich. Clamp tightly. Wipe away any excess glue with a damp cloth and allow to dry at least one hour.
8. **Optional:** Round the corners of your speaker using a disc sander.
9. Sand your finished piece and apply a stain or finish of your choosing.

EXTENSION CHALLENGES

1. Customize your speaker for a particular phone, taking into account where the phone's speaker is and whether you will be using it in portrait or landscape mode.
2. Research different amplifying shapes found in nature and redesign yours to have a different inner structure, or outer structure (ie: horn or shell shaped).
3. Use of a variety of router bits to add detail to the top edges of your speaker.
4. Use a wood burning tool to customize your speaker with details.

Jewelry

Starting in kindergarten, students are required to explain how their Applied Design, Skills and Technologies project affects the environment. The focus on evaluating environment impacts continues throughout the elementary curriculum. By grade 9, students are expected to be able to critically analyze and prioritize sustainability considerations and evaluate a variety of materials for reuse, recycling and biodegradability. Helping students identify ways to utilize found wood and waste wood from other projects is a great way to introduce sustainability and innovation in material sourcing when they take on projects at home.

Care should be taken when choosing the finish for these projects, as projects worn next to the skin need to be non-toxic. Tung oil, linseed oil, beeswax, or carnauba wax are food-safe options that would work well in this application.

NOVICE

Wood Rings

Wooden rings can be made of just about any 1" square of wood picked out of the waste bin. Harder wood will make for a more long-lasting ring and is a beautiful way to utilize offcuts from more valuable woods used in the shop. For best results, show students how to look for bits of wood that will produce a ring with end grain on the top side.

INTERMEDIATE

Striped Bangle

No Lathe Needed - For the intermediate level project, this striped bangle can be customized by students depending on what types and thicknesses of scrap wood they can scrounge. Initial shaping is done with a bandsaw or coping saw, with further shaping done with a benchtop sander.

ADVANCED

Wooden Sunglasses

Wooden sunglasses frames are an ideal project to address the secondary woodwork curriculum. This project involves many tools, including bandsaw or coping saw, planer, stationary sander, and Dremel. Students can bring in an old or broken pair of plastic sunglasses for design inspiration, potentially using the lenses in their new pair.

Photo credit: Melissa Newberry

CAREER BITE

Adea Chung

Adea Chung is the North Vancouver artist of "Billy Would Designs". Her jewelry collections are made exclusively from locally available reclaimed wood (including B.C. hardwoods, exotic hardwoods, and even skate decks). Adea's designs reflect both her commitment to sustainability and her passion for West Coast style. Her collections are available online and in galleries country-wide.

instagram.com/billywould **billywould.com**

What did you do in high school that connects to your career as a jewelry designer?

I went to high school in Clinton and 100 Mile House, British Columbia. In Clinton we had a fantastic shop teacher who had a passion for woodworking and metal work. He was generous with his time, skill and budget so it really allowed for ambitious projects and extra class time.

What training or jobs did you complete previously that led to this career?

My dad was a wood carver and also had a gallery for part of my teen years. I didn't realize it at the time but growing up with access to a workshop is such a luxury. My style of woodworking came about by experimenting and learning from others, which never ends.

What part of working with wood inspires you?

Wood is such a wonderful medium to work in. The colours and grain make everything you do one of a kind. I only work with reclaimed and recycled hardwoods so the wood regularly determines the design it will become. Often, we associate wood with a limited list of uses. When it's used for something unconventional (jewelry) it allows us to look at the details and beauty in even the smallest slice.

Wooden Rings

NOVICE

APPROXIMATE TIME: 3 1-HOUR CLASSES

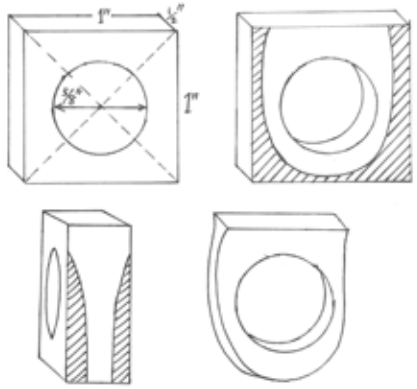
TOOLS & MATERIALS

MATERIAL LIST

- ½" x 1" square hardwood scrap (big leaf maple, arbutus, red alder, trembling aspen, white birch) (if prepping for a whole class, a ½" x 1" strip of wood to drill ⅝" holes 1" apart along, then cut into 1" square blocks for individual rings)
- Water based stain or vegetable oil, linseed oil – other finishes that are non-toxic

TOOL LIST

- Sandpaper (increasing grits) — start with 80 and work up to 220
- Sanding blocks
- Drill press
- ⅝" or 9/16" Drill Bits — depending on finger size
- Clamps
- Assorted round files



PROCEDURE

1. Starting with a ½" x 1" x 1" block, identify end grain and assign that as the "TOP" of the ring, or the part that you will look at when the ring is on your finger.
2. Decide what you want your ring's final shape to be, and sketch in pencil onto the wood.
3. Using the drill press or a hand drill, remove the middle of the ring. Pick the right size bit by measuring your finger first.
4. Using the vice to secure your ring, file down the extra material on the top and sides until you reach your desired shape.
5. Try the ring on and slowly file out more material from the center until your ring JUST fits. *Remember, you can always remove more, but you can't put wood back, so make sure to try the ring on often for this stage. Also, keep in mind that sanding your ring will enlarge the fit slightly, as will thinning the ring (in the knuckle-to-fingertip dimension) and rounding the inner edges of your ring.
6. Sand your ring starting with 150 grain sandpaper and working your way up to emery paper.
7. Choose a non-toxic finish, ensuring it is compatible with daily wear next to skin. If you apply the finish with 400 grit sandpaper it will smooth any rough areas.
8. Dispose of your rag safely as per your teacher's instructions. *Remember, oily rags can spontaneously combust and are a safety hazard in shop environments.

EXTENSION CHALLENGES

1. Glue together several layers of scrap wood to give your ring stripes.
2. Research how to inlay a jewel or piece of metal into the top as a focal point for your ring.
3. Carve an initial in the top of the ring using a Dremel tool.

Striped Bangle

INTERMEDIATE

APPROXIMATE TIME: 6 1-HOUR CLASSES

TOOLS & MATERIALS

MATERIAL LIST

- Chosen wood scraps, 4" square and flat, enough to stack to 2–3"
- Wood glue
- Large hose clamp (to approximate the inner diameter for bangle sizing)
- Linseed oil, vegetable oil or other non-toxic finish

TOOL LIST

- Bandsaw or coping saw
- Stationary belt sander
- Spindle sander (optional)
- Clamps
- Assorted round files
- Sandpaper – Variety of grits
- Sanding blocks

PROCEDURE

1. Using the bandsaw, cut your scraps into 4" squares
2. Design the order you want your pieces to be glued in. Play with variations in thickness to create patterns and visual texture.
3. Once you have decided on the layout, cover the faces of each wood slice with wood glue and clamp together. Be sure to wipe away any excess wood glue with a damp cloth.
4. When dry, mark the centre with an "x" by drawing diagonal lines corner to corner. Use a compass to draw two circles, one with a 2" inch radius (diameter 4"), and one with a radius for the inner part of the bangle. *Standard "medium-size" bangles have an inner radius of 2 - ⅜", but you may want to use a large hose clamp to check proper sizing by sliding it over your hand to make sure it's the right diameter. Adjust to your desired size, make sure you can slide your hand through it, and measure across at the widest point. Divide this measurement by 2 — this will be how far apart your compass points need to be to draw the inner circle of your bangle. Keep in mind that you will lose some extra material through sanding and shaping, so it's better to draw a smaller circle at this point than one that's already too large.
5. Using a straight edge, draw a line across the face of your bangle that just meets the inner circle on both sides. Cut this off with a bandsaw or coping saw. Next, carefully cut out in the inner circle.
6. Glue the piece from step #5 back onto your bangle, and clamp until dry.
7. Cut along the outer circle until your bangle is round.
8. Shape and sand the inner part of your bangle with the spindle sander. You can use the round files for finer details on the inside as well. Shape and sand the outer part of your bangle with the belt sander.
9. Once you have rough shaped both the inner and outer diameter, use the assorted grits of sandpaper to complete the final sand and polish.
10. Choose a non-toxic finish, ensuring it is compatible with daily wear next to skin.

EXTENSION CHALLENGES

1. After step 1, cut the block in half at an angle and glue in another layer of wood to make angled stripes in your bangle.
2. Using a Dremel tool carve a design or a name onto the outside of the bangle,
3. Carve or wood burn a hidden message into the inside of the bangle.

Wooden Sunglasses Frames

ADVANCED

APPROXIMATE TIME: 4 TO 6 1-HOUR CLASSES

TOOLS & MATERIALS

MATERIAL LIST

- Hardwood veneer, offcut rectangles minimum 3" x 7"
- 2"x 4" x 7" long
- Maple for the arms (approx. ½" x 4" by 6")
- Two long glasses screws
- Wood glue
- Non-toxic finish

TOOL LIST

- Bandsaw
- Scroll saw
- Drill (⅛" bit, and another tiny bit that fits the diameter of the glasses screws)
- Dremel with sanding bit
- Stationary belt sander
- Sandpaper — assorted grits

PROCEDURE

1. Mark the centre of the 2x4 on both of the long, thin sides this will represent the midpoint of your glasses frame on the top and bottom, along the midpoint where your nose goes.
2. Take the arms off your plastic glasses and place the frames on the long, thin side of the 2x4 so that the top of the frames are resting on the wood. Trace around the glasses to get an outline of the sunglasses as if you were looking directly down on them from above (Bird's-eye view).
3. Draw a curve that roughly runs through the middle of this outline you drew and extend the line straight out to the sides of the 2x4.
4. Cut along this line using the bandsaw. This will be your mold for gluing the veneers in.
5. Place your veneer pieces gently into the mold and draw a pencil line along the veneer where it meets the edge of the mold piece, then cut off excess veneer. You should be left with three pieces of veneer a bit longer but the same width as the 2x4. If you alternate the grains of the veneers, it will make your sunglasses stronger.
6. Sandwich the three pieces together and mark them with pencil on the centre line on top and bottom where you drew on the 2x4.
7. Take the lenses out of your glasses and place the frames down on a piece of veneer. Centre them, and then use a pencil to trace around the outer rim of your glasses and the inner edge where the lenses go.
8. To hollow out the frames, drill "eye holes" in the top veneer layer, and use a scroll saw to cut out the lens holes.
9. Sand the surface. Be sure not to take too much material off. Use the lenses to check the progress of your sanding – these pieces should be very slightly smaller than the diameter of the lenses, so that they can hold the lenses in place. Use this top piece as a stencil to trace the lens holes onto the middle and bottom veneer pieces.
10. Cut and sand the middle veneer holes slightly larger (by 1/16"). When you sandwich the three veneers together, this larger hole will be the groove that the lenses pop into.
11. Cut the lens holes from the bottom veneer exactly the same size as the top veneer. Clean up this cut line with the Dremel or spindle sander, double checking with the actual lenses to make sure you don't take off too much material.

12 Line up the centre line pencil marks, then glue the three veneers together and place in the 2x4 mold, making sure that all the centre lines on the veneers and the 2x4 pieces line up. Clamp and wait to set, but do not let dry completely. Remove the veneers before completely dry and scrape out any glue that remains in the centre groove where the lenses will pop into.

13 Cut out the outer line using a bandsaw or scroll saw, then sand and shape with the Dremel tool until smooth.

14 To make the arms, line up the top of the plastic arm on the long, thin edge of the maple (½" x 6"), and trace around it with a pencil. Cut this line carefully on the bandsaw, then clean up with the stationary belt sander.

15 On the big surface (4"x6"), lay down your plastic arms and trace around them. Cut along these lines with the scroll saw. These pieces will be skinny — be sure to keep your fingers away from the blade at all times. Smooth and shape the edges and faces of your arms with sandpaper.

16 To make the hinges, line the arms up with the top corners of your frames, and divide them into three horizontal sections. Draw the lines with a pencil, make sure not to make them longer than ¼".

17 Cut the frames so that the top and bottom pieces remain, making a "U"-shaped notch, and cut the arms so that the centre piece remains, leaving a small tab in the centre. Be careful here not to cut off too much material. Cut small amounts off and keep checking to make sure the pieces fit snugly, and not too loose.

18 Sand away any material on the frames or the arms that prevent the hinging movement.

19 Fit the arm "tabs" into the frame's "U"-shaped notch, then drill down from the top through the three pieces of wood. Counter-sink this hole with a larger drill bit so the glasses screw will fit flush. Screw the arms onto the frames.

20 Sand all of your pieces smooth with 400 grit paper.

21 Apply your chosen non-toxic finish.

22 Pop the lenses in and they are ready to wear!

EXTENSION CHALLENGES

1 Make the frames out of one solid piece of maple. Trace the curves from your plastic glasses in all 3 dimensions and cut out on a bandsaw. Use a Dremel with a cutting disc to carefully carve out the groove for your lenses. Shape your glasses to include nose rests.

2 Find a way to use the metal hinges from an old pair of glasses instead of making wooden hinges.

3 Keeping the inside lines consistent to fit with the lenses you have, experiment with changing the outside shape of the glasses to try different "looks".

4 Use different wood veneers to achieve a striped look on the top and sides of your glasses.

5 Make a custom wooden case for your new glasses.

6 Using an old set of clear prescription lenses, try making wooden frames for reading or distance lenses.

7 Explore other materials, such as old skateboard decks, to create different design features.

Wooden Toys

Making toys as take-home projects is a classic way to motivate students to learn new techniques in woodwork. The many options for customization allow students to not only create a unique toy for their own amusement, but also enable them to play with the applied design aspect of the re-designed B.C. curriculum through "gathering information from potential users", building a prototype, and testing it. Simple toys are also an ideal product for students to explore the entrepreneurial objectives in the curriculum, as they are objects that can be fun to design, demonstrate, advertise, and sell.

NOVICE

Skills Canada Gravity Car

The Gravity Car and Race provides students an opportunity to model their designs off of known shapes, test their prototypes and amend their designs. It also offers cross-curricular learning of science-based concepts like gravity and friction. This project can be used as preparation for regional Skills Canada competitions. Visit skillscanada.bc.ca to get involved.

INTERMEDIATE

Wooden Kazoo

Kids and adults alike know the entertainment value of this easily mastered musical instrument. The building process involves the use of a table saw or bandsaw, stationary sander, and drill press, which makes this project an ideal introduction to using stationary tools. The kazoo's appeal, as well as the simplicity and reproducibility of this design and its hardware, make it an easy choice for students to explore entrepreneurship through simple profit calculations, making several kazoos at once, and even recording video demonstrations for advertising purposes.

ADVANCED

Plywood Skateboard

For the advanced project, the skateboard is a uniquely customizable project. It is also an item that many students may actually use on a daily basis or can design and make for someone who will. This project connects to other curricula including art, science, social studies and physical education. Students might be interested in researching the history of art & design on skate decks, or the physics of skate deck flexing and truck placement, wheel options, deck grip options, and much more.

CAREER BITE

Ross Atkinson

Ross Atkinson is the man behind Salt Spring Wooden Toys, and he has been making children's toys in his island wood shop for over a decade. His sons were his inspiration to design safe, healthy, non-toxic toys for all ages. Ross' products are not only designed for and tested by kids, but are environmentally sustainable, too. He reclaims and reuses wood left over from construction and other wood working projects that would have otherwise been burned or taken to landfill sites. Ross is always on the look-out for others'"scraps", in particular from flooring installers, cabinet makers, instrument makers and boat builders.

saltspringtoys.ca

What did you do in high school that connects to your career as a toymaker?

In high school I took woodworking and metal shop classes that provided me with a solid foundation in hands-on making. I also took art classes which helped with the creative process. Math class was also very helpful for figuring out how to make things (calculating angles, geometry, calculating stock needs and totaling sales and taxes).

What training or jobs did you complete previously that led to this career?

I have always made things for my home and for the people I love including handmade gifts and functional pieces like shelving units/book cases, furniture, jewelry boxes, toys/games, cutting boards, artwork etc. I also enrolled in some continuing education courses/classes (life drawing, pottery). Salt Spring has a world-famous Saturday market that I was keen to participate in, so I developed a small line of toys to sell at the market. Over time this grew, and the product family developed, and we were able to shift more time to toy making.

What part of working with wood inspires you?

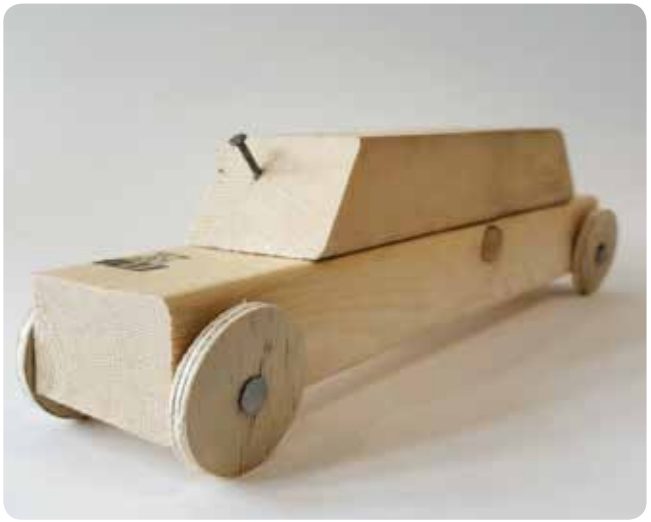
Our inspiration for toy designs comes from many places - from family and friends, the natural world, other toys, customers suggestions, books on toy making, requests from schools, and things we have seen on the Internet.

Whatever the source we make it our own idea by producing a prototype and refining it for production and aesthetics. We then make a small batch to see how they do at the market and make adjustments accordingly.

Skills Canada Gravity Car

NOVICE

APPROXIMATE TIME: 2 1-HOUR CLASSES



Note: If the gravity car is being used for competition at Skills Canada Competition, the following are the specifications:

The only source of energy is the Potential Energy from gravity as the vehicle sits at the top of the track. To fit in the track, the maximum size of the vehicle is 101mm (4 inches) wide, 152 mm (6 inches) high and 304mm (12 inches) long. There is a 600-gram weight restriction on the vehicle. The vehicle can be made from any common materials found in school such as wood, metal, plastic and recycled materials from electronic devices. The vehicles must be made from scratch by the students and not be constructed in any form from any type of kits.

TOOLS & MATERIALS

MATERIAL LIST

- Wood glue
- Assorted chunks of 4"x 6"x 12" – maximum dimension
- Welding rod or dowelling for axels
- Water based stain, paint
- 4 old CDs or DVDs

TOOL LIST

- Sandpaper (increasing grits) - start with 80 and work up to 220
- Sanding blocks
- Clamps
- Assorted files for shaping

PROCEDURE

1. Research the Skills Canada Competition specifications and requirements.
2. Design, plan and draw your custom design. Simple is often better.
3. Create a materials list – Review with your teacher to confirm available materials.
4. Build main body — be sure to weigh your body after each adjustment is made to ensure you meet the 600 gram or less requirement.
5. Assemble the wheel axles carefully — be sure to allow for adjustments with weight, as well as travel on the track. It is important that the car stays straight on the track.
6. Test your vehicle on a track that meets the criteria designed for Gravity Car competitions.

EXTENSION CHALLENGES

1. Design the car after a specific commercial vehicle or favorite toy.
2. Research and explore the concept of wind resistance and how that determined their choice for the final finish of the car.

Since 1994 Skills Canada British Columbia has worked with industry, educators, government and labour to promote rewarding and in-demand skilled trade & technology careers to BC's youth. Widely recognized for its annual 18 Olympic–style competitions hosted in communities throughout BC, Skills BC engages over 35,000 students annually in its regional, provincial, national and international competitions each year. www.skillscanada.bc.ca

Wooden Kazoo

INTERMEDIATE

APPROXIMATE TIME: 4 TO 5 1-HOUR CLASSES

TOOLS & MATERIALS

MATERIAL LIST

- Hardwood (maple, alder, oak, arbutus) – finished dimension of ⅛" x 6"x 6"
- Food grade finish
- Wood glue
- 1 x wing bolt and matching wingnut
- Waxed paper

TOOL LIST

- Clamps
- Drill press
- Sandpaper (increasing grits 80 to 220) or bench sander
- Bandsaw or scroll saw

PROCEDURE

1. Plane down an approximately 6"x6" piece of hardwood to ⅛".
2. On your piece, pencil in the outlines of the top and bottom pieces (1-½" by 6"), the side strips (¼" by 6"), and the waxed paper holder piece (1½" x 1").
3. Draw the ½" and wingnut hole placements for the top and waxed paper holder. Use a ½" Forstner for the big holes, and make sure you customize your small holes for the diameter of your wing bolt.
4. Cut out all 5 pieces on a bandsaw or using a scroll saw. Line the side pieces up, making sure the ⅛" edges are touching the top and bottom (the top and bottom pieces should be ¼" apart).
5. Fit the wing bolt into the hole you drilled in the top piece and arrange so that the wing bolt head is INSIDE the kazoo, then lay the top onto the side pieces. Make some light pencil marks along the inside of the top and bottom pieces so you can see where to place your side pieces when you are ready to glue.
6. Spread glue on surfaces, arrange your pieces, and clamp until dry.
7. Sand off the overhanging edges of the top and bottom pieces and round the corners. Be careful to keep the top of your kazoo very flat so that when you attach the waxed paper and the wingnut, the paper is held evenly and securely between the wood pieces.
8. Apply your oil or other food grade finish to your kazoo.
9. Using the waxed paper holder piece as a stencil, use a pencil to draw out the shape on a piece of waxed paper and cut it out. Put the waxed paper piece on the top of your kazoo to cover the hole, place the paper holder over top, line up the large holes, and secure with your wingnut.
10. Your kazoo is ready to play!

EXTENSION CHALLENGES

1. Consider how your procedure would change if you were to plan on making 20 kazoos at once.
2. Experiment by making kazoos with different dimensions and shapes (longer, shorter, wider, thicker, etc), different hole sizes and placements, angling the side pieces to make a trapezoid kazoo, different thicknesses, etc, to see if it changes the sound of the kazoo.
3. Laminate different colour hardwoods into a block and cut your top and bottom pieces at an angle to create stripes on your kazoo.

Cruiser Skateboard

ADVANCED

APPROXIMATE TIME: 5 1-HOUR CLASSES

TOOLS & MATERIALS

MATERIAL LIST

- Plywood (½" to ¾" thickness)
- New or used skate trucks (axels) and wheels
- Nuts and bolts to attach trucks
- Chosen wood finish or cloth finish for bottom of deck – student specific
- Grip tape for top of deck (or research and choose another method –i.e. adding non-slip particles to marine paint)

TOOL LIST

- Bandsaw
- Spindle sander
- Disc sander
- Palm sander
- Drill press
- Snap-blade knife

PROCEDURE

1. Research skate decks (cruising decks) online to see what shapes work best for the type of skating you'd like to do with your project.
2. Design the shape of your skateboard on a large piece of paper, this will be your design template. Make sure you consider the following: the width of your trucks, your foot size and chosen placement, the style of board you like, the dimensions of grip tape you have available.
3. Trace your board shape onto plywood using a pencil and cut to shape with the bandsaw. If you have designed a very curvy shape, be sure to make relief cuts in the wood.
4. Shape the edges and surfaces of your deck, keeping in mind that if you're using grip tape on the surface that it needs a flat surface to adhere to.
5. Place your trucks on the base of your board and mark the hole placement with a sharp pencil or awl through the truck holes. Be sure the trucks are parallel to each other! – This will be specific to the trucks you choose to use.
6. Set up the drill press to drill the holes. Be sure to check the size of the drill bit against the bolts needed for your trucks.
7. Sand any rough edges or splinters using sandpaper, by hand.
8. Add your chosen finish, design, applique, art to the bottom of the skate deck.
9. If you're using grip tape, peel the backing off and place it on the gritty surface to protect your hands as you smooth it to the board. Lay the sticky side of the grip tape gently on the top of your deck, starting in the middle and laying down the ends. Be cautious at this point, as the adhesive is strong and difficult to peel off if you lay it down in the wrong spot. Smooth it down from the centre outward to prevent bubbles.
10. Use a file to rub along the edge of the skate deck at a 45-degree angle, making a white line where the grip tape has been filed off. Carefully run a snap-blade knife up through the grip tape at the same 45-degree angle to cut off the overhanging grip tape. Run the file along the edge one more time to scrape away any excess grit around the edges.
11. Attach trucks, put your helmet on, and enjoy your new toy!

EXTENSION CHALLENGES

1. Research how to make laminated skate decks and try making a curved mold for producing shaped decks by laminating thin pieces of wood together.
2. Add a short second layer of plywood on the top of the tail (last quarter of length) of your board and feather it in to shape a "kick" at the back for trying tricks.
3. Cut designs into your grip tape before applying, making a pattern on your board or incorporating stickers or painted designs.
4. Instead of grip tape, research different non-slip deck finishes boat builders use (paint finishes with grit, lifted gel coats using a dry paint roller). Tape off sections of your deck and apply the chosen finish in a pattern or shape of your choice.

Animal Houses / Feeders

The B.C. Applied Design, Skills, and Technologies curriculum requires that students learn how to consider potential users of their products, as well as recognize the environmental impacts of the project's purpose, production, and life cycle. Students are expected to be able to "critically evaluate the success of their product and explain how their design ideas contribute to the...community and/or environment". Building an animal shelter or feeder that is customized to their local animal populations helps students directly observe the environmental impact of their finished product. Students could do a follow up project where they make observations of their product in action, and then research and redesign the original prototype to further its functionality.

NOVICE

Mason Bee House

Mason bees are important fruit and vegetable flower pollinators. They lay eggs and make their cocoons in small holes such as old woodpecker holes. Students can be encouraged to research how to take care of Mason bees and draw up a maintenance and cleaning schedule for their house. Some design factors they may choose to take into account are: mesh additions to the front to protect sleepy bees from bird predators, large roof overhangs to protect them from the weather, varying hole sizes to offer a range of nesting options, ease of access at the back of the house for seasonal cleaning, and a food-grade finish to ensure a healthy home for their bees.

INTERMEDIATE

Bat House

For a twist on the classic "bird house" project, our bat house encourages students to discover more about the diversity of the ecosystems around them – the variety of species, niches, and daily (or nightly) animal activities. Students may be interested to research which bat species in B.C. are at risk of extinction due to habitat loss. Bats tend to use small, tight spaces beneath loose pieces of tree bark to raise their young, and a successful bat house design needs to mimic this environment. A narrow, well-sealed, and darkly painted house is an attractive habitat for bat roosting, and will provide a protective, warm space for baby bats. Encourage students to research the best place to install their bat houses; similar to the Mason bee house, correct placement will increase the chances of the house being utilized by the animal species intended. House plans adapted from Bat Conservation International's single chamber bat box.

ADVANCED

Double Custom Bird House - Design Challenge

Designing projects that fit within a set of constraints is a big part of the curricular competencies required of students throughout the ADST and Woodwork curriculum. This project is set up as two lessons in which teachers and students identify inspiration and construction parameters of their bird houses before getting started with building. The project is student-led and student-designed, with the teacher taking more of facilitating and mentoring role. Students will be drawing inspiration from the architecture and style of a specific human home structure to model their birdhouse after, and also designing their bird house with specific dimensional constraints based on the nesting box needs of a local bird species.

CAREER BITE

Leslie Myers

Leslie Myers is a Professional Interior Designer and Associate at Number 10 Architecture Group in Victoria, BC. With a focus on commercial work and a flair for leading renovations, Leslie leads Number 10's Interior Design Department on projects ranging in scope and size.

numberten.com

What did you do in high school that connects to your career as a professional interior designer?

When I was 12 years old, I discovered what it meant to be an architect and at that point, I knew that my future included a career in architecture. Once I got into high school, I researched what I would need to do to become an architect and moved in that direction. After high school I was accepted into the University of Manitoba and achieved my Bachelor of Environmental Design with a major in Architecture. As no career path is completely linear, the positions I took on as an architect after graduation helped me discover that my true passion is in interior design.

What training or jobs did you complete previously that led to this career?

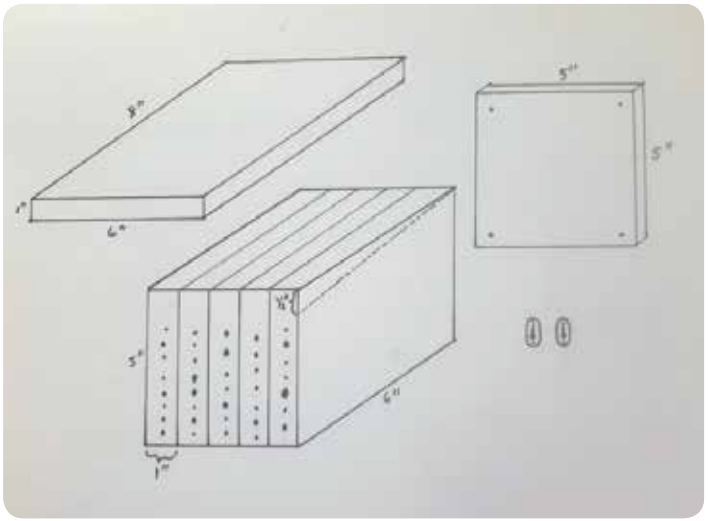
After graduating, I found that there were no jobs for young architects in my region, so I started out with an interior design firm working on residential design and renovation projects, from there, I went to work for a small architecture firm to gain experience as a project manager. During that time I learned a multitude of things, including how to write specs. In 2008, I was laid-off and it was the best thing that could have happened to me — it spurred me to search out new opportunities and eventually brought me to work with Number 10 in Victoria.

What part of working with wood inspires you?

Wood offers flexibility in design and is warmer than most man-made materials. It brings the outdoors into the workplace and provides a calming effect which increases the quality of the work environment.

Do you have any advice to share?

Life is not linear. Work hard and be open to opportunity.



Mason Bee House

NOVICE

APPROXIMATE TIME: 3 1-HOUR CLASSES

TOOLS & MATERIALS

MATERIAL LIST

- Five pieces 1"x 6" x 5" SPF per house
- Roof: one piece of 1"x 6"x 8", so it hangs 2" over the front, and ½" over the sides
- Back: one 5"x5" piece of plywood, any thickness
- Wood glue
- Food grade finish (optional)
- Parchment paper or waxed paper
- 2 keyhole hangers,
- 4 screws to install back panel (make sure screws aren't longer than the thickness of the plywood backing)
- 4 wood screws (to attach the back)

TOOL LIST

- Drill press with varying extra-long bits (for 6" deep holes) from 5⁄32" to ¼" for the house holes, and a small bit for the pilot hole to screw the back cover on
- Clamps
- Bandsaw (to angle the top of house for a shed roof, if you have the option in your shop)
- Pencil

PROCEDURE

1. Arrange the five 1x6 pieces together to form a large rectangular prism block, 6" deep. Spread glue on the sides you want to stick together, then clamp until dry.
2. OPTIONAL: At this point, if you choose to make a slanted roof, draw a cut line along the side of your structure, ½" from the top of the house front and angling up to the top back corner (see diagram). Ask your teacher to cut this line for you.
3. Lightly draw a pencil line down the centre of each 1x6 on the front of your house. Along these lines, mark pencil dots to plan the centres for your bee holes, ensuring that they are all at least ¾" apart from each other. Vary the sizes of your holes to give the bees options. Drill your holes right through the 6" SPF using a variety of extra-long bits between 5⁄32" and ¼".
4. Cut a piece of plywood to make a back cover for your house – You can lay your house on the plywood and trace around it, then cut the plywood rectangle out on the bandsaw or handsaw. Place the cover on the back of the house and drill 4 pilot holes the same diameter as the inner diameter of your screws.
5. Adding the roof: Centre the 8" piece of 1x6 on top of your house and draw the outline of the house on the underside of the roof so you know where to spread the glue. Spread wood glue on the top of your bee house and the underside of your roof, place the house onto the roof along your pencil lines, and clamp until dry.
6. If you choose to use a food grade finish, apply it to your house and the exterior of your back cover. Letting the wood weather is also an option.

7 Next, line the holes with parchment paper or waxed paper. Count how many bee holes you have and cut a rectangle of paper 8"x2" for each one. For each hole, roll the paper carefully around a thin pencil to make a long 8" tube, then push it into the hole from the back until the paper is flush with the front of your house. Pull the pencil out and fold the extra 2" of parchment paper tube down at the back to pinch it closed. Repeat for every bee hole. When all your holes are lined, screw the back-cover flush onto your house.

8 Screw the two keyhole hangers onto the top corners of the back cover.

9 Find the perfect place to put your Mason bee house. Ideally, it should be placed between 4' to 10' (1-3 metres) off the ground, facing the southeast so it gets lots of morning sunshine, and tucked somewhere that will protect the bees from wind and rain.

10 Research how to care for Mason bees and write up cleaning instructions and schedule manual for your house.

EXTENSION CHALLENGES

1 Mitre the roof to give it an angle down to shed rain water. Experiment with different angled roofs in different planes to make your house original.

2 Add some wire mesh (½" holes) to the front to protect sleepy bees from being picked off by birds on their way out of the holes.

3 Research food-grade dyes to colour or camouflage your bee house.

Bat House

INTERMEDIATE

APPROXIMATE TIME: 4 1-HOUR CLASSES

TOOLS & MATERIALS

MATERIAL LIST

- 1 piece of ½" x 24" x 60" exterior plywood
- 1 – 1" x 2" x 72" pine strip
- 30 – #8 x 1" exterior screws (resists corrosion)
- 4 – #8 x 1½" exterior screws (to fasten the roof)
- Exterior grade water-based stain, primer, and paint in a DARK colour
- Paintable latex caulk

TOOL LIST

- Table saw or portable circular saw
- Handheld drill or drill press
- Drill bits to drill pilot holes for #8 screws.
- #2 Robertson driver bit
- Caulking gun
- Paint brushes

CUT LIST

- Spacing strips (pine):
  1 - ¾" x 1½" x 24" (top)
  2 - ¾" x 1½" x 20½" (sides)
- Back wall (½" plywood):
  24" wide x 26" high
- Front panels (½" plywood):
  Upper panel 16 ½" x 24"
  Lower panel 5" x 24"
- Roof (½" plywood):
  3" x 24" (optional)

PROCEDURE

1. Measure, layout and cut the three panels. From your 24"x 60" piece of plywood, cut a piece 26" x 24" (back), 16 ½" x 24" (front top) and 5"x 24" (front bottom).
2. Using a scratch awl or nail, scratch horizontal groves, roughly ½" apart, on the back panel (this will create a rough surface for the bats to cling onto).
3. Apply the dark water-based stain to all inside faces of your wood pieces.
4. Lay the back panel down, grooved side down. Predrill pilot holes spaces similar to what is shown on the diagram. (½" from the corners and outside edges, approx. 6" apart)
5. Place the three spacing strips under the back and screw them to the plywood. These pieces should be flush with the outside edge of the plywood. Fasten the top strip first then butt the side pieces up to it. Use #8 - 1" exterior grade screws.
6. Caulk the inside seam where the strips and the plywood meet. This will help provide for a weather tight / warm interior for the baby bats.
7. Drill pilot holes in the front pieces according to diagram.
8. (flip back piece with spacers attached, facing up) Before installing the front pieces, put a bead of caulking on the faces of the front and side strips. (this will also help seal the unit to provide a dry / warm interior).
9. Fasten the top pieces using 1" exterior screws, leaving a ½" space for ventilation between the bottom and top panel. Make sure plywood is flush with the sides and wipe off any excess caulking with a damp cloth.
10. Measure, layout and cut the piece for the roof - 3" x 24" (optional)
11. Caulk the top of the house and screw the roof on using 1½" screws. (seal screws with caulking)
12. Caulk all outside joints and wipe off excess caulk.
13. Research the best way to mount your bat house.
14. Apply your exterior grade primer according to the instructions on the label, and then apply 2 or more coats of your chosen dark exterior paint finish.

EXTENSION CHALLENGES

1. Add roofing shingles or metal roofing to your plywood roof.
2. Research how to and make a larger bat house with multiple "rooms", or a bat house with specific dimensions for a local bat species.
3. Type up installation instructions for where to place your bat house and explain why it needs to be facing a specific direction or mounted at a certain height, etc.
4. Install an infrared camera so you can watch your bats roosting.
5. Make a bat-watching pamphlet that includes how to identify the species in your area that might use your bat house.

Double Custom Bird House

ADVANCED

APPROXIMATE TIME: 10 1-HOUR CLASSES

TEACHER'S GUIDE

LESSON ONE: UNDERSTANDING CONTEXT

EMPATHIC OBSERVATION AND SOURCES OF INSPIRATION MATERIALS:

- Internet access
- Blank paper for lists and brainstorming
- Sticky notes (3 pads or so)
- "Homework Guide" photocopies (one per student)
- General current knowledge of local housing issues

1 INSPIRATION TYPES OF HUMAN HOMES

Intro: 10 minutes

Give students blank note paper or a pad of sticky notes and get them into groups of two to four. Have them brainstorm and note down all the types of human accommodation or homes in their community or area they can think of. For example, apartment buildings, single-family homes, etc. Get them to think beyond what their own home situations are and come up with as many different structures a human could use for a shelter as they can. Discuss as a class and add sticky notes to the wall or board to make a master list students can draw inspiration from.

Discussion: 15 minutes

As a class, or in their groups, get them to discuss (and answer in writing, if you think applicable) the following questions regarding the sticky notes on the board:

- Have there been any local housing issues making the news recently? How do you think this has changed the living situations of people in your community?
- What is one type of home on the list you've never lived in but would be curious to know what living there is like? Why?
- What types of materials are these structures made of?
- Which of these homes do you think make the most efficient use of resources and space? Which make the least efficient use of resources and space? How do you know?

2 CONSTRAINTS LOCAL BIRD SPECIES THAT USE BIRD HOUSES

Brainstorming: 10 minutes

Think-Pair-Share. Hand students blank note paper and have them individually make a list of as many bird species that they know live in their local area. Next, students discuss and share their list with a partner. As a class, note down all the bird species on sticky notes and put on the board. Have the students assist you in grouping the birds into the following categories: "Birds that they think use bird houses", "birds they don't think that use bird houses".

Research: 15 minutes

In pairs, students use their computers to research which types of local birds use bird houses. Students collaboratively rearrange their sticky notes (and add sticky notes with species they didn't come up with on their own) to make a list of birds that would utilize birdhouses that they make. Students copy this list out on their homework guide sheet before the end of class.

3 ASSIGN HOMEWORK

Hand out the Homework Guide sheet and have students copy their list of birds that use birdhouses from the sticky notes on the wall/board. Read over the homework assignment with them.

LESSON TWO: DESIGNING WITHIN CONSTRAINTS

MATERIALS

- Computers with internet access
- Printer
- Large blank paper or graph paper for design sketches
- Pencils and erasers
- Rulers
- Photocopies of any of the procedures in this book as examples for students to follow
- Photocopies of the "Design Guide" handout page

HAND-INS

- Design Guide handout page
- To-scale sketches

Research: 20 minutes

Students search online to find the optimal house dimensions for their chosen bird species (including the access hole diameter and position). Hand out the large blank paper, and have students draw a rough to-scale sketch (including all dimension indications) to illustrate the measurement constraints. You may choose to discuss how houses with species-customized dimensions are less likely to be used by types of birds other than their chosen species.

Designing and writing procedure: 40 + minutes

Students may choose to print copies of the pictures they took of their chosen building in order to take measurements from. Students adapt their rough sketch from the first part of the lesson to incorporate the design of the human built structure they chose.

Once they have a basic sketch, hand out the "Design Guide" photocopy and the photocopies of the sample procedures so they can begin to write their own step-by-step procedure.

Encourage students to keep making new sketches of their birdhouse plan and updated procedure versions until they get the joinery and dimensions to their liking (from the curriculum, "students are expected to do the following: Prototype, making changes to tools, materials, and procedures as needed", and "record iterations of prototyping"). They must draw and describe it in enough detail that someone who had no idea what the project was would be able to build it just by looking at their plans. You may choose to include a peer assessment component, where students give each other feedback about how clear their procedure reads to someone who isn't familiar with the structure and design.

Students who need a challenge could be encouraged to utilize more intricate joinery at the corners and add more detail from the original large structure into their bird house mode.

HOMEWORK GUIDE: DOUBLE CUSTOM BIRD HOUSE

NAME: _____

1 CHOOSING YOUR INSPIRATION BUILDING

Take a walk around your neighbourhood or community/town/city. Observe the different buildings and structures where people live, and choose one that you feel inspired to make a birdhouse model of. Take pictures of your building from several different angles so you can copy the dimensions and scale it down to birdhouse size. Write a short paragraph describing why you chose the building you did in the space below:

2 CHOOSING YOUR BIRD SPECIES

List of bird species that use bird houses or nesting boxes:

Research bird species living in your neighbourhood by finding an expert to interview: ask around to find out who are the local birders, biologists, First Nations and other elders, science teachers – anyone who might have observational knowledge of local bird populations. Contact one (or more) of these people to discuss the local bird populations, and ask them if they have any suggestions about what type of bird they think you could choose to build your house for. Some sample questions to initiate conversation could be:

1) "Are there any bird populations that you notice have been struggling or on the decline?"

2) "Which birds are endemic, and which have been introduced?"

3) "Do you think there is a specific species of bird that could benefit from having an extra house to nest in?"

Write a paragraph detailing which type of bird you have chosen to build a house for and why. Justify your choice with a minimum of two reasons, and include at least one quote from your interview.

DESIGN GUIDE: DOUBLE CUSTOM BIRD HOUSE

NAME: _____

Complete this page, and staple your large to-scale drawings to the back before handing in.

Chosen Bird Species: _____

Recommended bird house dimensions (LxWxH, access hole diameter, and any additional considerations):

Materials list:

Tools list:

Safety Considerations and Precautions:

Procedure ROUGH DRAFT: (Include key steps and instructions)

Cross Curricular Ties

Incorporating cross-curricular elements into your wood work projects provides a way to encourage a diverse group of learners by connecting applied learning to science and other curriculum areas. It also provides a way to cover design theory components in the new curriculum such as the grade 8 Big Idea: "Design can be responsive to identified needs". The concept of creating an object or tool with wood products instead of resorting to buying plastics to solve day-to-day needs, for example, can be a revolutionary idea for students. Embedded within these cross-curricular projects is the basic joinery of a traditional woodworking class, and students can be encouraged to try using different types of corners on these "boxes", while thinking outside of them to the purpose and function of what they are making.

NOVICE

Planter Box

The planter box project provides a multitude of design options, as well as cross-curricular ties to biology and to food studies (depending on what they choose to cultivate in their finished planter). Students can be encouraged to design their planters to accommodate specific plants with particular soil depth and lateral space requirements, as well as customizing dimensions to fit specific gardens or patios. This project is also an ideal one to introduce students to wood types, especially western red cedar, as a uniquely robust option for outdoor (and perpetually damp) projects.

INTERMEDIATE

Laser Cut Lantern

This lantern design, submitted by Steve Classen, has cross-curricular ties to physics, computational thinking, computers, power technology, and media arts. Students will learn how to apply their chosen designs into the laser engraving program to customize their lantern side cutouts. Steve has also provided instructions on how to create a fading LED circuit board project to light the lantern up from inside.

ADVANCED

Pinhole Camera

Pinhole cameras are an ideal project to connect woodworking to the physics of light, the chemistry of film development, as well as the history and art of photography. The inner dimensions and film-spooling components of this design have been standardized for 35mm film, but other formats of film could be incorporated (including panoramic options) allowing for endless design opportunities to both the interior and exterior of the camera.

CAREER BITE

Arlene McPherson

Arlene McPherson is a journeyperson cabinetmaker and owner/general manager of McPherson Cabinetry. McPherson Cabinetry opened its doors five years ago and is unique in many ways, including its commitment to inclusive hiring practices and its sustainable business practices — which include a preference to purchase local and North American products whenever possible.

mcphersoncabinetry.ca

What did you do in high school that connects to your career as a cabinetmaker?

When I was in high school, girls were not allowed in the shop, however, I grew up on a farm and spent time at home learning to make things. It was those experiences on the farm that helped me to discover an appreciation of making things. I was never afraid to use tools or work with my hands.

What makes someone a good cabinetmaker?

A good cabinetmaker is someone who is passionate about their work, has attention to detail, and an interest in solving problems. They are independent thinkers and motivated workers. If someone is keen and wants to learn, they would do well in cabinetmaking — from design to installation, there are a number of opportunities in the industry.

What part of working with wood inspires you?

Being creative as well as responsible is what still excites me about being in this industry. While the wood supply has seemed limitless in the past, we now know that we have to use it responsibly. Solid wood is wonderful and beautiful, but there can also be beauty in particleboard, MDF and other manmade products that come from wood wastes. Using those materials creatively is every bit as rewarding and worthy as using solid wood.

A good design and a beautiful, functional home can change the quality of life, which directly impacts mental health. The beauty of wood and wood products can elevate peoples' moods and at the same time is a connection to the natural world.

Planter Box

NOVICE

APPROXIMATE TIME: 1 TO 3 1-HOUR CLASSES

TOOLS & MATERIALS

MATERIAL LIST

- 1" x 2" SPF or cedar lengths
- #8 - 1 ¼" decking screws (42 per planter)
- 1' x 4" SPF or cedar lengths

TOOL LIST

- Chop saw or handsaw
- Drill press
- 3⁄32" drill bit
- Sanding blocks
- Robertson driver bit for cordless drills
- Cordless drill
- Robertson hand screwdrivers

CUT LIST

Each planter will require:

- 4 – 1"x 2" x 13 ½" side rails
- 4 – 1"x 2" x 10 ½" side rails
- 12 - 1"x 4" x 11" side pieces
- 3 – 1"x 4" x 9" bottom pieces
- 2 – 1"x 4" x 12 ½" feet

Pre-drilling: for less experienced students some of the pieces can be pre-drilled using a 3⁄32" drill bit

– The long side rails should be drilled at 1.125", 3.25", 6.75", 10.25" and at 12.25"

– The short side rails should be drilled at 1.75", 5.25" and at 8.75"

– The feet should be drilled at 0.75", 3", 6.25", 10" and at 12"

PROCEDURE PART 1: THE SIDES

1. Lay three of the side pieces side by side on the workstation. Place one of the 10 ¾" side rails across the top of the side pieces.
2. While your partner holds the side pieces tight against the work station, screw the side rail to each of the side pieces with one screw.
3. Put a second short side rail across the bottom of three side pieces. Screw the side rail to each of the side pieces with one screw.
4. Repeat steps 2 and 3 to create a second short side.
5. Repeat steps 2 & 3 using the long side rails. When you put the long side rails across the three side pieces it should stick out evenly on either side. You can use the edge of the work station to determine how far it should stick out.
6. Repeat step 5 to create a second long side
7. Stand the four sides up, creating an open box. Screw the 2 sides with the long rails to the 2 sides with the short rails.

PROCEDURE PART 2: THE BOTTOM

1. Lay three of the 9" bottom pieces side by side on the workstation.
2. Put one of the 12 ½" feet across the three bottom pieces. The ends should stick out approximately ½". You can line up the end of the foot with the pencil mark on the work station. While your partner holds the bottom pieces tight against the work station. Screw the foot to each of the bottom pieces with one screw.
3. Put the second foot across the three bottom pieces lining up the end with the pencil mark. Screw the foot into each of the three bottom pieces with one screw. You have now completed the bottom.
4. Slip the bottom into the opening of the box. You may need to tap the bottom until the two feet are both touching the sides.
5. Screw the feet to the box.

EXTENSION CHALLENGES

1. Build two planters out of different wood, do not apply finish, and observe how the different materials degrade over time during outdoor use. Example: red cedar vs maple.
2. Research a few different types of commonly grown garden plants, or speak to a gardener who might want to use a planter you build, and customize your planter depending on the depth of soil required, the amount of drainage required, etc.
3. Research types of trellises and build an addition on your planter to accommodate sweet peas, runner beans, or any type of vine that requires support.

Laser Cut Lantern

INTERMEDIATE

APPROXIMATE TIME: 4 1-HOUR CLASSES

TOOLS & MATERIALS

MATERIAL LIST

External wooden lantern:

- ⅛" Baltic birch plywood (approx. 24" x 5")
- Tracing paper

Internal lamp:

- Electric LED candle or make an LED circuit

TOOL LIST

External wooden lantern:

- Illustrator or any other vector program
- Laser cutter
- 220 grit sandpaper
- Glue stick
- Clear polyurethane finish
- Paintbrush

PROCEDURE

External wooden lantern:

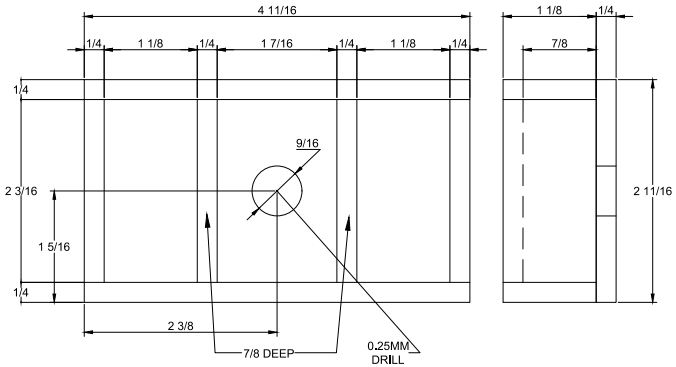
1. TEACHER – Enter the six lantern shapes and proper dimensions into Illustrator or other vector software for students to use. Lock the layer so they cannot modify the pieces. Alternately, the pieces can be carefully cut with a scroll saw if no vector program or laser cutter is available.
2. STUDENTS – Choose images from the internet for the four sides of your lantern and arrange them onto the side pieces in your vector program. Use the "trace" function so the laser will cut the outline of each shape.
3. Load the laser cutter with your ⅛" plywood and run the program to cut the pieces.
4. Use 220 grit sandpaper to sand off the burn residue, then apply a clear polyurethane to all sides.
5. Cut 5 pieces of tracing paper to back your cutouts – one for each of the four sides and one for the top circle cutout. Use a gluestick to glue the tracing paper to the inside faces of your plywood pieces.
6. Place an LED into the lantern, or if you chose to make the LED circuit, attach the circuit board holder to the inside of the lantern using tiny screws or a glue-gun.
7. Assemble the 6 plywood pieces into the lantern shape as shown in the photograph.

Internal lamp:

1. Remove one side of the lantern and place an electronic LED candle into the bottom.

EXTENSION CHALLENGES

1. Increase the dimensions of the lantern to accommodate a wireless speaker for a multi-sensory product.
2. Design centerpieces to decorate a fancy dinner event for a friend or family member
3. Make a string of party lights by making several tiny versions of the lantern and hanging them up.
4. Drawing from your physics or robotics courses, design your own LED circuit with a coin battery and a switch for your lantern.



Pinhole Camera - Design Challenge

ADVANCED

APPROXIMATE TIME: 10 1-HOUR CLASSES

TEACHER'S GUIDE

The pinhole camera project is designed to have students take control of the design and prototyping processes, while the teacher takes more of a facilitating and mentoring role. Lesson 1 is a research period that covers the Woodwork curricular competencies requiring students to " [identify] criteria for success... and any constraints", and to "[generate] and [add] to others' design ideas". Lesson 2 is a design period that focuses on prototyping and coming up with materials and tool lists, as well as "recording iterations of prototyping".

LESSON ONE: DEFINING AND IDEATING

TOOLS & MATERIALS

MATERIAL LIST

- Internet access
- Blank paper for lists and brainstorming
- Photocopies of the "Design Guide – Pinhole Camera" handout, one per student

HAND-INS

- Labelled sketch of pinhole camera inspiration, including source information.

RESEARCH: 30–60 MINUTES

In pairs, have students read through the Design Guide and identify the dimensions and general shape of the camera, as well as the constraints. Then, have them research pinhole cameras online to discover some different design options and ideas to inspire them. Remind them that as long as the inner dimensions are standardized according to the design guide, they can make the exterior look like anything they want. Have the students complete a labelled diagram of the camera that inspires them most during their research block.

HOMEWORK

Students read through the constraints on their design guide and brainstorm ways they might design their winding mechanisms. Have students bring in materials from home that might be useful in their prototyping process, for example, dowels, plastic pen tubes, chopsticks, etc.

LESSON TWO: PROTOTYPING

TOOLS & MATERIALS

MATERIAL LIST

- Blank paper or graph paper for sketching
- Cardboard
- Used aluminum pop cans
- Tin snips / scissors / utility knife for cutting aluminum
- 0.25mm drill bit and drill press / drill
- 35mm negatives or used film for students to take measurements if needed
- 35mm film canisters for scale
- Rulers
- Design Guide handouts from Lesson 1
- Various materials that could be used for winding mechanisms

HAND-INS

- Completed Design Guide handout page
- Cardboard prototype
- Labelled sketch of wood pinhole camera plans

Students will use the constraints listed on the design guide page and inspiration from their research to design and build cardboard prototypes of their pinhole cameras. They will then decide on the materials, tools, safety considerations, and a procedure to make a wooden version of their camera.

EXTENSION CHALLENGES

1. Research designs for panoramic pinhole cameras and redesign the original camera dimensions to accommodate wide-format photographs.
2. Create a curved support for the film so that it is all the same distance from the pinhole (helps prevent the edges from being out of focus).
3. Explore plans of pinhole camera obscuras, and make one that you can adapt to take photos of the image projected with your cell phone camera.
4. Research the procedure for developing black and white film, then try developing your own film from a photo shoot with your pinhole camera.
5. Try making a pinhole camera from a unique piece of found wood or driftwood.
6. Disguise your pinhole camera by making it look like a wooden version of an everyday object.
7. Make wooden frames for your favourite printed photos you took using your new pinhole camera.

DESIGN GUIDE: PINHOLE CAMERA

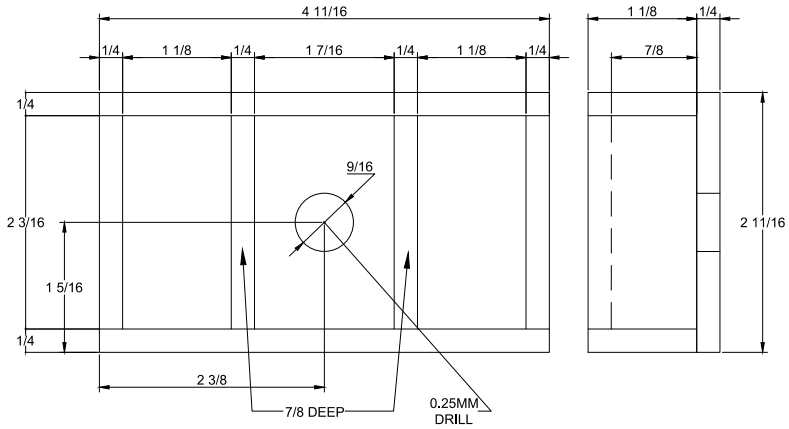
NAME: _____

1. On a blank piece of paper or graph paper, draw a labeled diagram of a pinhole camera that inspired you while you were researching. Include a minimum of three labelled details that you thought were important, and make a note of the URL or book where you saw the camera so you can find it again. Staple your sketch to this handout.

2. Using the constraints listed below, build a prototype of your pinhole camera using cardboard, tape, a small piece of aluminum pop can with a 0.25mm pinhole, and any other various materials you might need to create your winding mechanisms.

   Constraints:

   - Your camera must be light-tight (ie, the only light getting in to the film at any time is from the pinhole ONLY).
   - Your camera requires a removable light-tight back to load and access the film.
   - Your camera requires a 0.25mm pinhole in a small piece of the side of an aluminum pop can (minimum 1.5cm square, or a circle with 1.5cm diameter). Design a way to mount this piece of metal to the middle of the front of your centre compartment.
   - The pinhole must only ever be open to let light through for a short amount of time to expose the film. Design a shutter that covers the pinhole at all times to protect your film, but easily opens when you are ready to take a picture.
   - You must design two winding mechanisms: a "film advance" one to wind the fresh film across the back of the centre compartment and into the left compartment, and a "rewind" one to wind it back into the original canister before opening the camera to remove the film. Keep in mind the following:
     - o You can ask for a used film container at any developing location. Carefully tape the end of the new roll of film to the snipped end of the used roll. Design a winding mechanism on top of your left compartment that turns the spool on the OLD film roll to pull the new film out of the right compartment into the canister on the left. When the film no longer winds, you know the roll is finished. Next, have a winding mechanism on the RIGHT compartment to rewind the film back into the original spool. When the film no longer winds, you know that the film strip is safely back inside the canister and the camera can be opened.
     - o To ensure you are winding the film far enough to prevent double exposure (overlapped photos), but not so far that you waste film between shots, come up with a way to standardize your winding mechanism (one idea is to count the number of "sprocket" holes that need to pass across the back of your centre compartment and include a noisemaking clicker mechanism that allows you to count holes by listening as you wind).
   - Your camera's internal dimensions must match the following diagram:



DESIGN GUIDE: PINHOLE CAMERA

NAME: _____

3 Make your plans for building your camera out of wood. Decide on wood type, thickness, dimensions, fastenings, joinery, winding mechanisms, door / back closure design and mechanism, shutter mechanism, and the ordered steps for making it. Use the space below for your first draft, and make new lists as your design develops, making sure that you note the dates on each list. Hand in all copies of your plans so your teacher can observe how your plans developed and what steps you took to solve problems along the way.

Materials list:

Tools list:

Safety Considerations and Precautions:

Procedure ROUGH DRAFT: (Include key steps and instructions)

Labelled sketch: Draw a labelled sketch of your design and staple it to this page to hand in.

BC CURRICULUM ADST TABLE

		TECHNOLOGY DEVICE HOLDERS			JEWELRY			WOODEN TOYS			ANIMAL HOUSES/ FEEDERS			CROSS CURRICULAR TIES		
		TABLET STAND	ANIMAL PHONE STAND	PASSIVE PHONE SPEAKER	WOOD RING	STRIPED BANGLE	WOODEN SUNGLASSES FRAMES	SKILLS GRAVITY CAR	KAZOO	SKATEBOARD	MASON BEE HOUSE	BAT HOUSE	CUSTOM BIRD HOUSE	PLANTER	LANTERN	PINHOLE CAMERA
APPLIED DESIGN, SKILLS, AND TECHNOLOGY K - 3																
BIG IDEAS	Designs grow out of natural curiosity				■	■		■			■			■		
	Skills can be developed through play							■								
	Technologies are tools that extend human capabilities	■		■	■	■		■			■			■		
CURRICULAR COMPETENCIES	Choose tools and materials	■	■		■	■					■			■		
	Make a product using known procedures or through modelling of others	■	■		■			■			■			■		
	Use materials, tools, and technologies in a safe manner							■			■			■		
	Explore the use of simple, available tools and technologies to extend their capabilities	■	■		■						■			■		
APPLIED DESIGN, SKILLS, AND TECHNOLOGY GRADES 4, 5																
BIG IDEAS	Designs can be improved with prototyping and testing	■	■		■			■	■							
	Skills are developed through practice, effort, and action	■	■		■			■	■		■	■		■	■	
	Complex tasks may require multiple tools and technologies								■		■	■			■	
CURRICULAR COMPETENCIES	Gather information about or from potential users									■				■		
	Identify key features or user requirements	■	■		■			■	■		■	■		■		
	Identify the main objective for the design and any constraints							■			■	■		■		
	Generate potential ideas and add to others' ideas							■				■				
	Test the product							■	■							
	Make changes and test again, repeating until satisfied with the product							■	■							
	Determine whether their product meets the objective and contributes to the individual, family, community, and/or environment							■			■	■				
	Identify skills required for a task and develop those skills as needed														■	
	Use familiar tools and technologies to extend their capabilities when completing a task			■			■	■				■			■	

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APPLIED DESIGN, SKILLS, AND TECHNOLOGY GRADES 6,7																
BIG IDEAS	Design can be responsive to identified needs	■		■							■	■		■		■
	Complex tasks require the acquisition of additional skills	■	■	■	■	■						■			■	
	Complex tasks may require multiple tools and technologies	■	■	■	■	■						■			■	■
CURRICULAR COMPETENCIES	Empathize with potential users to find issues and uncover needs and potential design opportunities			■	■				■			■		■		■
	Use materials in ways that minimize waste				■				■			■		■		■
CONTENT	Ways in which wood is used in local cultural and economic contexts	■	■	■								■		■		
	Characteristics of wood as a material	■	■	■										■		
	Woodworking techniques and basic joinery using hand tools	■		■	■				■			■		■		■
	Computer system architecture, including software														■	
	Simple computer-aided drafting programs														■	
APPLIED DESIGN, SKILLS, AND TECHNOLOGY GRADE 8																
BIG IDEAS	Design can be responsive to identified needs	■		■			■			■		■	■			■
	Complex tasks require the acquisition of additional skills	■		■		■	■					■	■			
	Complex tasks may require multiple tools and technologies			■		■	■					■	■			
CURRICULAR COMPETENCIES	Empathize with potential users to find issues and uncover needs and potential design opportunities			■		■	■			■		■	■			■
CONTENT	Manual and computer-aided drafting techniques														■	
	Advantages of using vector files														■	
	Conversion and transmission of energy														■	
	Identification, characteristics, and properties of a variety of woods, both manufactured and natural			■					■	■			■			
	Elements of plans and drawings	■	■	■					■			■	■			■
	Woodworking techniques	■	■	■		■	■		■	■		■	■			■
	Traditional and non-traditional joinery using hand tools and power equipment	■	■	■			■		■			■	■			■
	Options for reuse of wood and wood products				■	■			■							

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APPLIED DESIGN, SKILLS, AND TECHNOLOGY GRADE 9																
BIG IDEAS	Social, ethical, and sustainability considerations impact design											■	■			
	Complex tasks require the sequencing of skills			■		■	■					■	■		■	■
	Complex tasks require different technologies and tools at different stages			■		■	■		■			■	■		■	
CURRICULAR COMPETENCIES	Engage in a period of research and empathetic observation in order to understand design opportunities			■						■		■	■			■
CONTENT	Digital output devices														■	
	Components of an electrical circuit														■	
	Identification, characteristics, properties, and uses of wood from various tree species			■												
	Woodworking techniques and basic joinery using hand tools and traditional and non traditional joinery			■					■			■	■		■	■
	Techniques for adjusting plans and drawings												■		■	■
WOODWORK 10																
BIG IDEAS	User needs and interests drive the design process	■		■		■	■		■	■		■	■		■	■
	Complex tasks require different technologies and tools at different stages			■		■	■		■			■	■		■	
CURRICULAR COMPETENCIES	Engage in a period of research and empathetic observation in order to understand design opportunities			■						■		■	■			■
CONTENT	Project design opportunities			■			■		■	■		■	■		■	■
	Identification, characteristics, properties, and uses of wood from various species			■												
	Choices related to the sustainable use of wood								■				■			
	Uses and creation of plans and drawings			■					■			■	■		■	■
	Function, uses, and role of portable and stationary power equipment in the creation of a project			■			■		■	■		■	■			■
	Function and use of hand tools			■						■			■			■

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WOODWORK 11																
BIG IDEAS	Design for the life cycle includes consideration of social and environmental impacts											■	■			
	Personal design interests require the evaluation and refinement of skills					■	■					■	■			■
CURRICULAR COMPETENCIES	Engage in a period of user-centred research and empathic observation to understand design opportunities											■	■			■
	Identifiy potential users, intended impact			■		■				■		■	■			■
	Make decisions about premises and constraints			■		■	■			■		■	■			■
	Identify and apply sources of inspiration									■		■	■			■
	Visualize and construct prototypes, making changes to tools, materials, and procedures as needed									■			■			■
	Record iterations of prototyping												■			
	Identify and communicate with sources of feedback															
CONTENT	Simple woodworking and design			■			■			■		■	■			■
	Measuring instruments											■	■			■
	Material conservation and sustainability									■		■	■			
	Operation of stationary power equipment in the processing of material					■	■			■		■	■			■
	Hand-tool processes in the creation of a product					■				■			■			
	Design for the lifecycle									■		■	■			
WOODWORK 12																
BIG IDEAS	Personal design interests require the evaluation and refinement of skills						■			■			■			■
	Design for the life cycle includes consideration of social and environmental impacts											■	■			
CURRICULAR COMPETENCIES	Engage in a period of user-centred research and empathic obervation to understand design opportunities									■			■			
	Identify potential users, intended impact									■		■	■			■
	Make decisions about premises and constraints						■			■		■	■			■
CONTENT	Complex woodworking and design						■					■	■			■
	Creation and use of working pictorial and written plans						■						■			■
	Selection of wood based on its characteristics and properties									■			■			
	Interpersonal and consultation skills to interact with clients												■			
	Types, purposes, and application of finishes						■		■	■			■			
	Layout and use of materials to minimize waste and conserve material					■		■	■	■		■	■			

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ADDITIONAL RESOURCES

Heads up for Safety • Work BC • Wood Innovates BC
Naturally:Wood • BCFII • Wood First

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