Lesson 2 Polygon Collage

Learning Objectives

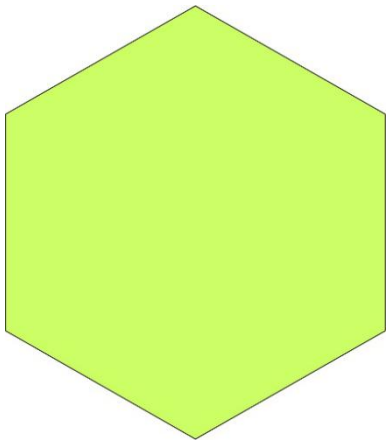
Students will:

1. learn teamwork from honeybees;
2. design their own motto and signature and work on engraved handwriting;
3. be able to use the **Marquee** tool in the laserbox software.

Preparation

1. **LaserBox**
2. Pre-cut hexagonal wood boards
3. Sheets of white paper
4. Find a spacious area in the classroom to let students build their hexagon collage projects.
5. Paints, drawing pens, colored cards (optional)

Session 1 Lead-in



Show students the picture above and ask them: What shape is it?

Possible answer: It's a regular hexagon.

Dig deeper when you hear the correct answer from students, and ask them another

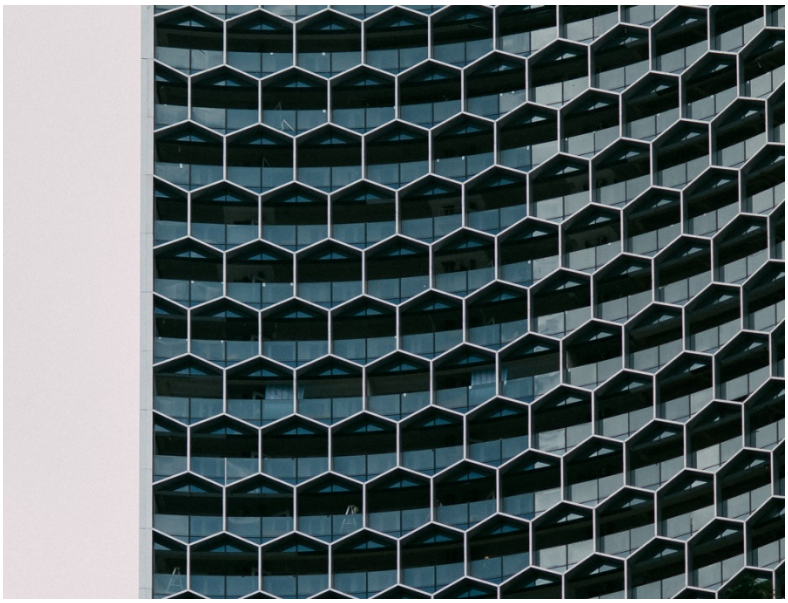
question, "Can you name out any animals whose house is made of regular hexagons?"

Give instructions: "The answer is honeybees. Honeybees make regular hexagons in their hives. A regular hexagon has six equal sides and six equal angles. Scientists were amazed by the honeycomb structure and acknowledged honeybees as inspiring architects. Moreover, honeybees are perfect in economizing—using the least amount of resources (in their case, wax) while creating the largest storage room (beehives). According to some research, regular hexagons could use the least amount of material to create the largest space without leaving gaps in between. A honeycomb can be home to hundreds of thousands of bees."

"Mathematicians found out that only equilateral triangles, squares and regular hexagons can tessellate, i.e. fit together to build a flat surface without any gaps. The regular hexagon is used in many fields, like mathematics, architectures, landscape design and art, because it's stable and tightly-arranged and can create the largest space with the least amount of resources."

Session 2 Show Examples

French architecture studio AtelierD created a Bee Pavilion. The creation of the pavilion is a perfect combination of honeycomb structure and human imagination, and a sign for human-insect harmony.



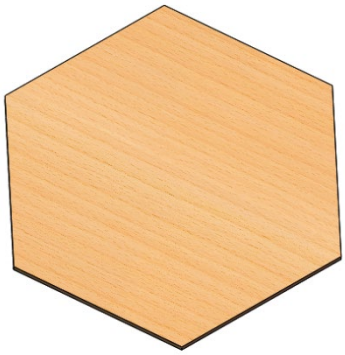
DUO, a twin-tower architecture in Singapore, is a project co-developed by Singapore and Malaysia. Ole Scheeren is the designer of DUO. The building is symbolic of co-existence and harmony among cities. Its honeycomb design is a symbol of the symbiotic relationship between the two countries.

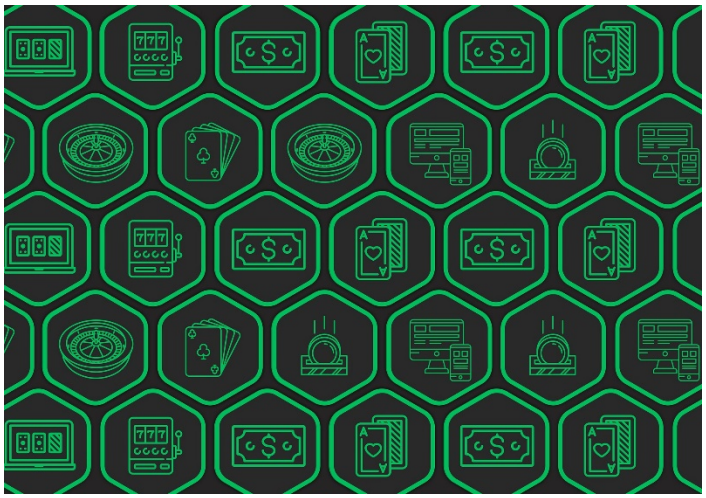
Session 3 In-class Task

Give instructions: "We can learn about teamwork from honeybees. Thousands of honeybees work hard together to build their honeycomb. A class is to students as a honeycomb is to honeybees."

Take out the hexagonal wood boards, and introduce the task: "During this session, we need to write down our name or motto on the hexagons, then we'll use the **LaserBox** to engrave the letters on the boards. The last step is to build our own 'honeycomb'

with the engraved hexagons."





Session 4 Introduce New Knowledge

Introduce the **Marquee** tool.

"We need the **Marquee** tool to complete the task. First, we write down our signature or motto on the paper. A reasonable arrangement of the words is highly necessary, otherwise our signature or motto might not be completely shown on the hexagon. After we finish our design, put the paper in the laser cutter, and open the **laserbox** software. Create a new project in the software, and we can see what's happening in the machine from the main interface. Click the **Marquee**  icon, then draw a square around the design you made on the paper to highlight it, and adjust its size

before moving it to the hexagonal board displayed on the software interface."

Demonstrate

- Hand out the hexagonal wood boards.
- Write down your name or a motto on the paper.
- Put the paper and the hexagonal wood board in the **LaserBox**.
- Open the **laserbox** software, then click the **Marquee**  icon.
- Press the **Start** button on the machine.

Independent Practice

- Have students work on their designs.
- Use **LaserBox** to engrave students' drawings.

Session 5 Share

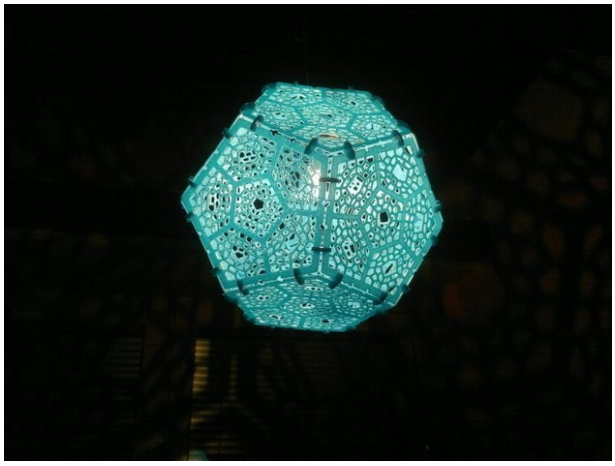
When the processing is complete, have students share their favorite motto or a sentence to the class. At last, choose an area in the classroom to let students fit all the hexagonal name/motto plates together.

Session 6 Wrap-up

"To conclude, we've learned about the honeycomb structure and its applications. More importantly, we applied the structure to our 'home'. We're all like little bees, contributing to our class together."

Session 7 Extension

You can not only engrave but also hollow out a polygonal wood board. Here shows an example of hollow-out regular dodecahedron which is built with regular pentagons. Put a light bulb in it to turn it into a customized lamp.



Shadow Lamp –Table version by formenmacher (Source: https://www.thingiverse.com/thing:2719955)