

# Western Engineering Outreach

*Aviary Architect*

*Grade 3-5*

*Meet Today's ENG HERO!*



*Ayman El Ansary* - Assistant Professor and Associate Chair with Western Engineering

Ayman El Ansary is an Assistant Professor in Civil and Environmental Engineering at Western University. Dr. El Ansary's research interests lie in the area of Structural Engineering and Engineering Optimization. His main fields of expertise include response of structures to seismic and wind loading, analysis and stability of liquid-storage tanks under hydrostatics and hydrodynamic loading, and structural shape optimization. To learn more about Dr. El Ansary, please visit:

[https://www.eng.uwo.ca/civil/faculty/el\\_ansary\\_a/index.html](https://www.eng.uwo.ca/civil/faculty/el_ansary_a/index.html)

## *Learning Goals:*

- Grade 3 : 2.2 investigate, through experimentation, how various materials (e.g., paper and wood) and construction techniques (e.g., folding, adding layers, twisting/braiding, changing shapes) can be used to add strength to structures
- Grade 4: 3.7 describe structural adaptations that allow plants and animals to survive in specific habitats
- Grade 5: 2.4 use technological problem-solving skills to design, build, and test a frame structure that will withstand the application of an external force

## *Materials:*

- |                      |                   |                  |
|----------------------|-------------------|------------------|
| • Cardboard          | • Bubble wrap     | • Bird seed      |
| • Tin foil           | • Skewer          | • Plastic baggie |
| • Cardstock          | • Popsicle sticks | • Ruler          |
| • Construction Paper | • Scissors        |                  |
| • Cheese cloth       | • Glue            |                  |
| • Foam sheets        | • Thermometer     |                  |



## Engineering and Science Connections:

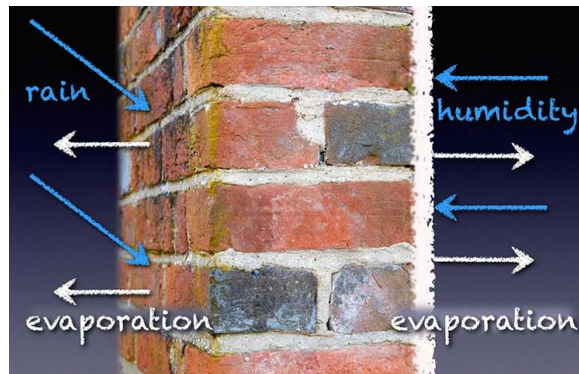
### Background:

Environmental engineering is the integration of science and engineering principles to improve the natural environment, to provide healthy water, air, and land for human habitation and for other organisms, and to remediate pollution sites.

Environmental engineers design systems that help reduce waste, such as wastewater treatment systems, municipal sewage, and efficient recycling systems.

Today we will be looking at environment engineering on a smaller scale, we will be studying bird habitats and designing birdhouses for birds to keep them cool during the hot summer heat.

When we talk about “breathability” in buildings, we aren’t referring to the movement of air within a building, rather the movement of water.



Water moves in and out of buildings constantly as both a liquid and as a gas, and is practically everywhere: inside the building, outside, in the walls, floors and roofs. Breathability is one of the most important relationships between the building and the world and it affects almost everything to do with the building health and performance.

The more breathable a building is, the better it will help to keep things inside cool. New buildings and renovated buildings need to be built from low energy, minimally processed bulk natural materials. Materials such as timber, earth, stone, straw and other natural fibres are not only the best materials from an environmental point of view. They are also the best materials from a performance point of view. They provide us with houses which are simple to design, build, maintain, and which give health and satisfaction to those who live in them.

All Canadian birds that stay in Canada through the winters are born with the ability to withstand extreme cold. They have built in abilities to withstand temperatures like -30 Celsius, by going into a temporary hypothermia overnight. Having the ability to withstand these frigid temperatures, means that on the opposite end, when we have + 30 Celsius temperatures, Ontario birds definitely feel the heat.

## Activity:

### Intro:

Go outside for 10-15 minutes to gather materials you think you may want to build with (i.e. twigs, leaves, etc.). Remember that as environmental engineers, we are not disturbing living things by uprooting them, we are simply removing any materials already fallen off or detached from living plants.

Ever wonder how birds stay safe during hurricanes? Watch the video below to find out.

*Video Recommendation:* <https://www.youtube.com/watch?v=DNvJ4E3mw9Q>

### Design Challenge:

Today we are going to challenge you to build a bird house that will keep birds cool on really hot days in the summer. The bird house has a few requirements:

- It must be no larger than 20 cm x 20 cm x 10"
- It must be able to hold a cup of bird seed inside (can keep it in a plastic baggie) if you were to lift it up in the air
- It must have an entrance for the "bird" (thermometer must fit through this entrance)
- It must have a perch for birds to land on (skewers or cardboard are a good idea)

Here are some questions to help you brainstorm your build:

- What materials do you think would help the structure to breath?
- What materials do you think would be safest for a real bird?
- What shape of roof do you think would help repel the heat best?
- Do darker colours reflect more heat?
- Would a cheese cloth keep the structure breathable?
- Where could you place the bird house so the birds feel safe entering it?

Blue Jay



Cardinals





Take a piece of paper and make a planning sheet, this will allow you to plan out your design before you start building. Once you have finished making your planning sheet, you can start building your birdhouse! Be creative and have lots of fun!

When your birdhouse is complete, go outside and find a place to put it. Try to place your birdhouse in a sunny spot. Take an initial temperature reading inside your birdhouse as a comparison for later.

Allow the birdhouses to sit outside for at least 2 hours. After the time has passed, go back outside to take temperature readings of their birdhouse. The smaller the difference in temperature, the more effective your birdhouse was! This means that it will be very helpful at keeping birds cool during sunny days!



## What Did You Learn?



- About birds and how they survive in different types of weather
- How to use materials from the environment to build a stable structure
- How civil engineers build in the natural environment and how animals adapt to humanmade structures

## Future Learning



- What are some other structures whose designs are impacted by the environments they are built in?
- Investigate these further by learning about tornado shelters, bunkers, and other structures that are built to protect people from the environment

## Share your creations!

We would love to see what you made. Email us at [discover@uwo.ca](mailto:discover@uwo.ca) or tag us on social media.

Instagram: @westernueng

Twitter: @westernueng

Facebook: @westernueng

*Thanks for discovering with us!*