

## “A Safe Landing”

*This week for Science, we present to you a STEAM (Science, Technology, Engineering, Art and Math) Challenge:*

**Can you design, build and test a homemade device that will allow a raw egg to be dropped without breaking?**

*Adaptation: if you do not have an egg at home, try the experiment with another, delicate item: an apple, a banana, a water balloon, a cookie...*

### **Scenario:**

We belong to the developing civilization of Oocytes, a kind and caring society from the planet Ooo. We are a curious lot and are now developing space travel. We would like to send our first oonauts (astronauts to humans!) to our nearest planet that we think may even have aliens. We need help to design, build and test a “Lander” that will allow us to land safely when we arrive. Our bodies cannot tolerate much physical damage!



### **The Challenge:**

1. Your task is to design, build and test your Lander using everyday household materials that you have at home. *If you have a sibling at the middle school, feel free to collaborate with them!*
2. You can test your equipment from various heights. Think about stairwells, balconies or second floor windows. You **MUST** have permission and adult supervision for testing of heights over 2m.
3. A landing is considered a success if your egg is in one piece. It may have cracks, but as long as it is not broken open, it is considered a success.
4. Your passenger must be able to be **easily removed** from your Lander once on the ground. Glueing your egg inside a foam block is not allowed!

Similar to our Rocket testing last week, NASA and other space agencies have faced this very same problem and have come up with many different and clever engineering solutions; these usually involve some type of parachute and often some soft cushioning materials to reduce impact forces.

Parachutes are easily made from paper/plastic bags, tape and string, while many cushioning materials can be found at home. Feel free to search similar egg drop challenges on the internet, BUT the best approach is to USE YOUR IMAGINATION!

**As you tackle this challenge, break it down into steps.**

1. Clearly understand the problem. (*The problem: How can you land safely on a hard surface from a normally fatal height for the Oocytes?*).
2. Based on your experience and materials available to you, design a prototype. Think of the prototype as your hypothesis, while the things that limit what you are able to do are referred to as Design Restrictions.
3. Test your prototype, working up from very low heights to as high as you are able.

***Follow Up:***

Send a photo or video of your Lander and your highest successful landing (with measurements) to your science teacher and we will announce the winner of this challenge next week. Creativity, artistic touches and awesome designs will also be recognized. Have fun!

Make careful observations as you go through this process, using the sheet below. Remember that observations are facts about something. They are made using your five senses (*smell, taste, touch, sight, and hearing*), counting or measuring. **Qualitative observations** are the types of observations based on “qualities” – in other words, using the five senses. **Quantitative observations** (which sounds like “quantity”), are those observations you make by measuring or counting.

**Inferences** are assumptions that you make after you have made your observations.

If you need more examples of inferences and qualitative and quantitative observations, here are a couple of videos that explain these differences quite well.

- <https://www.youtube.com/watch?v=fBIR7taW9jk>
- <https://youtu.be/Lt3FuRpQNmE>

Drop Height (low to large heights)	Quantitative Observations	Qualitative observations	Inferences (to be made <i>after</i> observations)
<div style="display: flex; align-items: center;"> <div style="border-left: 2px dashed black; height: 100%; width: 10px; margin-right: 5px;"></div> <div style="padding-left: 10px;"> <p><i>EXAMPLE: 1.5m</i></p> </div> </div>	<ul style="list-style-type: none"> <li>• <i>Descent took 3 seconds</i></li> <li>• <i>3 cracks in egg: the largest is 2cm, the smallest is 4mm</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Made a crunch sound on landing.</i></li> <li>• <i>Lander did not fall in a straight line</i></li> <li>• <i>Yolk is leaking: egg feels damp</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Probably need more cushioning in order for egg to better survive impact.</i></li> </ul>

