

## Group Activity for Teaching Alternation of Generations

This activity is intended to be part of a teaching unit focused on plant life cycles (alternation of generations). It focuses on a homosporous life cycle (like that of ferns).

### **Learning objectives/outcomes:**

These suggested learning outcomes reflect a basic level of understanding that students could be expected to have after doing this activity (with appropriate reinforcement).

1. Name the stages/phases of the plant life cycle, and their ploidal level.
2. Identify the processes that occur in the life cycle and where they occur.
3. Explain the genetic similarity between various phases of the life cycle.

### **Supplies needed:**

- Several paper cups (5-10 for a small class)
- Stack of blank paper
- Colored markers or pencils (optional but fun)

### **Setup Steps:**

This activity works best with a group of at least 10 students. For the setup steps below, there should be equal numbers of sporophytes and spores, and then a smaller number of gametophytes with an equal number of eggs. Any remaining students will end up as sperm. The numbers below are for a group of ~40 students but can be adjusted as necessary.

1. Ask for **10** volunteers to be **sporophytes**
  - They should each draw a picture of a sporophyte (use the blank paper)
2. Ask for **10** volunteers to be **spores**
  - They should each make several spores from a torn-up piece of paper
3. Ask for **5** volunteers to be **gametophytes**
  - They should each draw a picture of a gametophyte
4. Ask for **5** volunteers to be **eggs**
  - They should each get a paper cup and make one egg from balled-up paper
5. Everyone else gets to be **sperm**
  - They should each make several sperm from a torn-up piece of paper, ideally making them a bit elongated (pencil-shaped)

Once the setup steps are completed, and the students have made their drawings and other props, you can move on to carrying out the activity. Below are the directions to give the students, followed by questions to ask the group after each step is completed. The questions could be added to throughout or used as the basis for a short discussion, or you can move quickly through the steps and come back to ask the questions at the end.

### **The Activity:**

Have the students stand in one part of the room, leaving as large an open space as possible. They will gradually move into and around this space.

1. **Sporophytes** should please stand around the open space, holding up your pictures.  
⇒ Ask: “What is the ploidal level of sporophytes?” [Answer: diploid, 2n]
2. **Spores** should please go and stand next to a sporophyte (one per sporophyte).  
⇒ Ask: “What is the process by which spores are made?” [Answer: meiosis]  
⇒ Ask: “What is the ploidal level of spores?” [Answer: haploid, 1n]
3. **Spores** should disperse! (throw your spores away from you, into open space)
4. **Gametophytes** should now each choose one spore to stand by and put the gametophyte picture next to the spore, on the ground (not all the sporophytes will have successful spore recruitment, which is why there should be fewer gametophytes than there were sporophytes and spores).  
⇒ Ask: “By what process do spores turn into gametophytes?” [Answer: mitosis]  
⇒ Ask: “What is the ploidal level of gametophytes?” [Answer: haploid, 1n]
5. **Eggs** should go to a gametophyte and put their cup on top of it, with the egg inside.  
⇒ Ask: “By what process do gametophytes make eggs?” [Answer: mitosis]  
⇒ Ask: “What is the ploidal level of eggs?” [Answer: haploid, 1n]
6. **Sperm** should also each go to a gametophyte.  
⇒ Ask: “By what process do gametophytes make sperm?” [Answer: mitosis]  
⇒ Ask: “What is the ploidal level of sperm?” [Answer: haploid, 1n]
7. **Sperm** should disperse! (throw them towards the eggs - try to land in a cup!)  
⇒ Ask: “Did we have any successful fertilization events??” [hopefully yes, if not they can pretend and just put a sperm into a cup with an egg]  
⇒ Ask: “What stage results from fertilization?” [Answer: new sporophyte]  
⇒ Ask: “What is the ploidal level after fertilization?” [Answer: diploid, 2n]

### **Follow-up questions:**

There are many possibilities depending on the course and its learning goals, but you could ask about genetic similarity between spores, eggs, and sperm; selfing vs. outcrossing in the context of this life cycle; modifications to this life cycle in heterosporous plants; etc.