For Grades 4-6

The Waggle Dance: 10 minutes per round, all students can participate

This game can be played either in a classroom or outside, but should be in an area where students have room to move around.

Objectives:

Primarily students should learn how bees communicate sources of food (pollen and nectar) to other bees in the hive. Secondarily students should work through a task designed to develop critical thinking and problem-solving skills

Materials needed:

- Colored paper (crumpled into balls)- these act as "pollen sources"
- Index cards- these tell the waggle dancer where to find their pollen

Game prep:

Hide colored paper balls around the classroom/outside. These are pollen sources that one student, a worker bee who has just been out foraging, has found. On individual index cards write the location of each pollen source (one hiding spot per index card). This card should indicate both **distance** (eg "10 steps") and **direction** (eg "towards the window," "towards the bushes"), and may have a colored spot indicating the **quality** of the pollen source (eg green = great source, yellow = moderately good source, red = suitable/poor source).

Gameplay:

Students should work in groups of 3 or 4. Give one student in each group (the forager) an index card telling him or her where the pollen source is that he or she has just been foraging on. The student then tries to communicate to the other group members, without speaking, where the pollen is located (analogous to the waggle dance in honey bees). The other group members must determine how far away (how many steps) and in which direction the pollen is, and then can locate and bring back the pollen to be sure.

For an extra challenge hide paper of different colors, corresponding to a ranking of food quality. In addition to determining distance and direction of the pollen source, group members can also determine how good the pollen is. Once one student has finished and the group members have found the food source, switch waggle dancers until every group member has had a chance to tell the group where the pollen is.

Students performing the waggle dance can communicate in any manner, except with words. This could include hand signals (eg pointing to indicate direction, holding up fingers to indicate number of steps, thumbs up/down to indicate food quality), head gestures, or body motions. Encourage students to be creative with their waggle dances, but remind them that the key factors to determine are the number of steps and the direction towards the pollen (and pollen quality), so they should consider how best to communicate this.

Discussion

After the game have the students come back together as a whole class and discuss what they did. Provide some discussion questions for them to think about: what was difficult about communicating the food source location and why was it hard? Were they able to tell their group where to find the pollen without talking? If they were able to communicate distance and direction, could they also get across the quality of the food? How was their "dance" similar to or different from what honey

bees do? See which groups/individuals were most effective at communicating and ask what they did that worked best; ask others what didn't work and ask the students to come up with reasons for why it might not have worked as well.

For Grades 1-3

Pollinating Flowers: 5 minutes per round, all students can participate

This activity can be played inside a classroom or outside, where students have some space to move around, and where groups can spread out.

Objective:

Students should understand the parts of a flower and each of their roles in pollination. Students should also learn how flowers use bees to exchange pollen.

Materials needed:

- Small cups
- Fruit Loops, animal crackers, or some other small snack- these act as a nectar reward for the forager bees, distributed by
- Colored pompoms- these act as pollen, which will be stuck to foragers by flower stamens
- Double sided tape, string, and cardboard strips

Game prep:

Distribute the Fruit Loops and pompoms into separate cups. Each flower group should receive its own color of pompoms, and should also receive one cup of Fruit Loops and one empty cup. Poke a hole through the cardboard strip and pull the sting through the hole. Place a piece of double sided tape on the piece of cardboard and tie this around each forager's arm.

Gameplay:

Students should break up into "flowers," comprising a pair of students, and "foragers." Each flower is made up of one student holding a cup of pompoms (this student acts as the stamen), and one student holding an empty cup (this student acts as the pistil), with a cup of Fruit Loops (the nectar reward) on a desk next to them. Flowers stand in different locations throughout the classroom/outside so that they cannot exchange pollen.

Foragers travel between flowers, collecting one piece of "nectar" from each flower. When a forager arrives at a flower the stamen places one of his pompoms (a pollen grain) on the forager's arm. This represents the forager accidentally picking up some pollen when he is visiting a flower. At the same time that the stamen places pollen on the forager's arm, the pistil removes any other pollen on the forager's arm and places it in his cup. The pollen removed by the pistil, however, must be a different color than the pollen in the stamen's cup. If the forager contains pollen of the same color as the flower group the pistil cannot remove the pollen, as this is self-pollination. Once the foragers have collected nectar from several flowers rotate students so that everyone gets a chance to do all parts of the activity.

Discussion:

At the end of the activity have the students observe the results of their pollination. Ask them how many different flowers (different groups) they collected pollen from, and ask them what that means, with the goal of having them understand that flowers need pollen to reproduce. Would the

activity have worked without the foragers? Why do the flowers need foragers to exchange pollen? What do the foragers gain from pollinating the flowers?