



Volunteer Information (9 January, 2018)

Hi, welcome and thank you for volunteering to help with **Science on Ice** during our **tenth** season. The following guide is intended for volunteers and ice rink staff helping with the **Science on Ice** field trip. The science portion consists of a 45 minute guided lecture led by T-Jay Clevenger or Martha Lovett that includes three demonstrations and two hands-on activities. To help the program, there are varying levels of assistance required for each demo or activity listed below. The skating lesson portion is led by a skate instructor and is 40 minutes. Everyone is needed to help with the skating lessons and especially with the beginner skaters. We would like all volunteers to be at the rink at 8:50 AM on the day of the field trip. This allows 30 minutes for set-up before the students arrive at 9:25-9:30 AM.

HANDS ON, Speed of Diffusion Through Water: This activity involves 10-12 beakers filled to about $\frac{3}{4}$ height with water. The beakers are placed on a table in a row with enough space so that each beaker can have three students next to it. Ordinary food dye droppers are used, and one is needed per beaker. Preferably the adjacent dyes are different colors as the students will repeat the activity once by passing the dye containers to the left. The activity procedure is to have each student place just one drop of dye onto the surface of the water in the beaker. Each student should start at the same time, and the time is kept by observing the ice rink clock. Time starts when the drops hit the surface of the water and time will stop when the dye reaches the bottom of the beaker. Students will compare this time to a calibrated chart in the presentation in order to determine average speed of the dye diffusion through water. Volunteers will help students get to the beakers, and determine who will be doing what portion of the measurements (one student uses the dropper, one student is the timer, and one student is the observer). Clean up after the students return to the bleachers.

DEMO, Dry Ice (CO²) Temperature: For this demo a block of dry ice, gloves, non-contact Infrared (I R) thermometer, and a glass container with water are required. One volunteer will wear gloves in order to hold the block of dry ice. The volunteer will show the students that the dry ice is well below room temperature. Generally the IR thermometer will read about -10 to -15 ° F. After the students are shown the dry ice temperature, the block of dry ice will be placed in the water container. Blue dye can be added to “wow” the students. We use this demo to introduce students to another type of solid substance (frozen CO₂) and to relate phase of matter to both temperature and pressure.

DEMO and HANDS ON, Puck Slingshots: SET-UP This activity includes all the volunteers. This activity requires the most setup time and should be done first when volunteers arrive. Each slingshot station is composed of the following items: four different weight pucks, a slingshot (keep the slingshots in the office to warm up the rubber tubing), a blue PIRA blanket to kneel on, a record sheet with clipboard and pencil, and one length marked rope. All items are ready for the students when they get out onto the ice surface. The marked rope must be setup in advance so the rope has time to secure to the ice surface by freezing. A small amount of water poured onto each end of the rope during setup will secure the rope. The rope is marked with blue paint



every 1--foot increment, and every 5--foot the blue mark is replaced with a red mark. The rope should start at the slingshot (at the goal line) with the end that has no mark. The rope will end with a red mark at 30--foot mark. When multiple slingshot stations are placed side by side the ropes will tend to form lanes that keep the puck travel from individual slingshots under control.

DEMO, Sling Shot Procedure on the Rubber Mat: The sling shot procedure demo requires a puck and a slingshot. Two people are needed. This is to demonstrate how to use the slingshot for the subsequent hands-on activity. The slingshot will be laid on the rubber mat in front of the bleacher. Two demo volunteers will each place one foot or knee on the ends of the slingshot to hold it in place. One person will pull the slingshot back while the other person will load the puck. Demonstrator needs to reinforce that the slingshot should be pulled straight back and not pulled up. Also the idea of teamwork is reinforced.

HANDS ON: Each weight puck is fired twice and distance traveled is recorded to the nearest foot. If the puck travels beyond the rope guides then distance beyond the end of the ropes will be measured by an adult volunteer with a supplied tape measure. Volunteers need to help each station in order to keep them moving along quickly. After eight pucks are shots, the students need to record the puck weights from the powerpoint slide that will be on the screen. Volunteers can put away sling shot materials during the remaining portion of the science lecture.

DEMO, Object Moment of Inertia: This demo will consist of a small ramp and two discs. The discs will have identical diameter and mass, but one disc will be solid while the other one is a ring. This is to demonstrate that two seemingly identical discs can spin differently based upon the distribution of mass throughout the objects structure. Two volunteers will be needed to help with this demo. One volunteer calls upon the students for assistance (at least one boy and one girl). The volunteer gives the student the two discs, and then instructs them to place the discs at the top of an inclined board and instructs the student to release the two objects down the ramp simultaneously. The second volunteer will determine which disc went the furthest and return the objects to the first volunteer. It is important that both objects be released from rest and not pushed down the ramp. The volunteer selects another student (boy or girl) and repeats. Discuss the results, which disc went further? The solid disc should accelerate faster and go further but results may vary depending if they were released at exactly the same time, or rubber mat irregularities.

DEMO with 2--3 students, Spinning Human (Angular Momentum): This demo utilizes a spinning platform and a set of handheld weights. One volunteer is needed for this demo. A student will be chosen from the audience to stand on the platform holding the hand weights, and then the volunteer will spin the student. The student



will start spinning with the arms in the extended position. Once the student is spinning freely he/she will then pull their arms in towards their chest and this will result in an increase in angular velocity. Be careful not to spin too fast, as the students will fall off. The volunteer should help the student onto the spinning platform by offering a hand and positioning one foot on the top of the platform so it doesn't move. Explain to the student that you will spin them slowly and that after about one turn they should bring their arms with the weights in their hands into their chest. If they spin two or three times before doing this they get too dizzy. Also explain, before spinning, that once they speed-up they should extend their arms back out to slow down. They should not try to step off the platform until the volunteer has stopped them. The volunteer needs to stand so she does not get hit, but close enough so if the student starts to fall, the volunteer can catch them.

Skating Lesson

5--7 volunteers with skates assisting: After the science portion, students will pick up skates from the skate shack and helmets from the bin while the Zamboni cleans the ice. After the students put on their skates, volunteers will check all skates for proper fit and tightness, most students do not know how tight skates should be. Lead skating instructor will demonstrate proper falling techniques on rubber mats, and outline goals for the skating lessons (Separate Group into "**Beginner**" and "**Advanced**") before entering the ice. Lead skating instructor will first work with the "**Beginner**" group then rotate to the "**Advanced**" group. "**Beginner**" group will use the west end of the ice and "**Advanced**" group will use the east end. A few volunteers will use the red skater's helper for those beginner skaters who need extra assistance.

- 10:15 -10:30 AM student put on skates and helmets. Proper falling dry land demonstration 2 minutes.

10:30 to 11:10 AM. Skate lessons, free skate if time permits. Students return skates and helmets and sit in bleachers for wrap-up discussion.

11:10 to 11:20 AM. Depart Palouse Ice Rink at 11:20 AM.

- Based on a 35-40 min time frame, new instructions on the next skill will be given in 5-7 minute intervals. Students can then practice the new skill before introducing next skill.
- The "**Beginner**" group will learn the following skills:
 - Proper way to fall
 - Marching/skating across the ice
 - Forward Swizzles/backward wiggles
 - Snowplow stop (in place or moving)
 - Dips



- Forward one-foot glides
- The “**Advanced**” group will learn the following skills:
 - Proper way to fall
 - Forward/backward swizzles
 - Forward one-foot glides
 - Snowplow/hockey stops/backwards V-stop
 - Forward crossovers
 - Two foot spin
 - Backward crossovers, depending on time and ability of the skaters

At the end of the skating lesson, the lead skating instructor will do a spin to demonstrate the conservation of angular momentum as a volunteer described the principles. Start spinning slowly with arms out, and then bring them closer to your body to increase speed.

DEMO Large Sling Shot: The large sling shot with the two curling stones (one adult stone-44 lbs and one junior stone-22 lbs.) will be set up on the ice. Four volunteers are needed, two volunteers hold the sling shot with knees, and one volunteer pulls the sling shot back and one volunteer loads the curling stone. The distance of each stone is observed and discussed by a volunteer. The junior stone should go further.

A photo is usually taken of the students and volunteers for the schools yearbook. After the photos, volunteers will assist everyone returning their skates and helmets and sit back on the bleachers for a brief wrap-up discussion.

FIELD TRIP SCHEDULE

Introduction Remarks **Science on Ice** (Andy, or someone else) at 9:25 AM

Welcome to Palouse Ice Rink, the coolest place in town

- Alturas Analytics is one sponsor
- Schweitzer Engineering Labs is another sponsor
- Terragraphics International Foundation is the third sponsor
- Introduce rink manager and other volunteers
- Outline plan for the morning

Science lessons, hands-on activities and skating lessons



- Porta-potty in back, if needed
- Lead intro discussion: What Olympic sports take place on ice?
- Introduce T-Jay Clifford or Martha Lovett, science instructors

Finish Science Lesson 10:15--10:20 AM

- As T-Jay or Martha conclude science portion, signal to Zamboni driver (they will be at the Zamboni gate) to clean the ice.
- Instruct students to line up for skates and helmet.

Skate lesson 10:30 AM

- Have the students wait by the entrance gate, introduce the Skate Instructor
- She or he will demonstrate proper falling techniques on rubber mats.

End of skate lesson 11:08 AM

- Line up all the students along the boards for an angular momentum demonstration (spinning). During the spinning talk with the students about how her weight distribution affects how fast she spins.
- The large sling shot with the two curling stones is then used to reinforce their sling shot activity.
- After the two demos, take a photo along the board of students and volunteers. (Some teachers prefer to take the photo off the ice.)
- Direct students to place skates on the blue shelves and helmet in the helmet rack.

End of Field Trip Review 11:17 AM

- Review the three topics discussed on the bleachers
 - Phases of water; gas, liquid and solid (dye in the water, perfume and solid ice)
 - Newton's Second Law $\text{Force} = \text{Mass} \times \text{Acceleration}$
 - Angular Momentum Spinning hands in and out
- Give a round of applause for the volunteers and instructors
- Mention public skating, figure skating, curling, and youth hockey
- Pick up a free skate pass from Rink Manager on way to the school bus
- Give teacher the student's data sheet and follow-up activity sheet

Conclude at 11: 20 AM

- Brief follow-up with the instructors and volunteers: improvements, plans for the next session