**Instructional Days: 18-21**

**Topic Description**: Students work on final unit project.

**Objectives**:

The students will be able to:

* Incorporate all unit objectives into the final project.

**Outline of the Lesson:**

* Explanation of final project (15 minutes)
* Completion of final projects (150 minutes)
* Presentations of final projects (55 minutes)

**Student Activities:**

* Groups work on final projects.
* Groups present final projects.

**Teaching/Learning Strategies**:

* Explanation of final project
  + Distribute final project explanation.
  + Divide students into groups of 3-4.
* Completion of final project
  + Monitor student work, answering questions as necessary.
  + Final measuring
  + Compare teams’ solutions.

**Resources**:

* Final Project (Adapted from CS Unplugged Ice Roads-Steiner Trees)
  + <http://csunplugged.com/sites/default/files/activity_pdfs_full/unplugged-15-steiner_trees_0.pdf>

**Final Project**

* Bring students outside or to a wide open area.
* Read description of the problem from CS unplugged activity.
  + “The previous activity, Tourist Town, took place in a very hot country; this one is just the opposite. In the frozen north of Canada (so the story goes), in the winter on the huge frozen lakes, snowplows make roads to connect up drill sites so that crews can visit each other. Out there in the cold they want to do a minimum of road building, and your job is to figure out where to make the roads. There are no constraints: highways can go anywhere on the snow—the lakes are frozen and covered. It’s all flat.  
    The roads should obviously travel in straight stretches, for to introduce bends would only increase the length unnecessarily. But it’s not as simple as connecting all the sites with straight lines, because adding intersections out in the frozen wastes can sometimes reduce the total road length—and it’s total length that’s important, not travel time from one site to another.”
* Follow instructions 1-6 on the CS unplugged document with the students.
  + For the nodes of the network, use posts in the ground or something equivalent such as traffic cones. Represent edges by tying together lengths of rope between the nodes at approximately waist level for safety. Add or remove steiner nodes as desired, but use something to differentiate them from the pre-set nodes that cannot be removed such as a label or a cloth tied to it.
* Finally, set up a copy of the network on page 161 for each group, perhaps simplifying it a bit for convenience. Divide the students into teams of 3-4 to set up the shortest distance Steiner network possible.
* After they have made their Steiner networks, hold a final measuring of their networks to compare, and announce the winner based off which team has the shortest network.