Drexel-SDP GK-12 LESSON

- ***Communicating with Patterns and Symbols***

- *Wireless Communication*

- Subject Area (Unit): ***Engineering***

- Concept: Wireless Communication

- Objectives: This is the first lesson in a series of 4 directed at wireless communication. Part 1 covers the issue of communicating with symbols and patterns. Given a set of constraints, students are instructed to design their own communications protocol for providing directions on a map. Students will be able to….
  Recognize wireless communication systems in everyday life
  Understand the basic concepts used in wireless technology
  Understand how information can be translated into symbols and transmitted to others

- PA Academic Standards: *3.1.7ABCE, 3.2.7ABC, 3.4.7AC, 3.6.7BC, 3.7.7E*

- Grade Level: ***6***

- Setting/Group Size: Classroom split into small groups

- Duration/Time Required: ***1 60 minute session***

- Materials List: Map (see attached), Pencil, Science Notebooks

- Context: This is the first section of a 4-part wireless communications module designed to introduce students to the concepts of how information is sent using waves and to introduce concepts of how engineers operate. This first section deals with the basic concepts of wireless communication as in where we find it in our lives, where is it useful, why do we use

it and what are its limits and shortcomings. As an exercise students are given a scenario and ask to “engineer” as solution in the form of a communications protocol given a set of constraints. The problem provides them with basic insight as to how information can be coded and sent from point to point with written words or oral communication. Secondly it provides them with the idea that they can do this type of engineering with they basic skills they have in patterns and symbols that they have learned in class.

The students are told that they are living in Tokyo Japan. They are there studying as an exchange student. A friend is coming to visit, but is unable to read or speak Japanese to ask for directions. You have a very busy day and are not sure were in the area you will be when your friend arrives. The problem is that American cell phones do not work in Japan, so you have no way to communicate to your friend directions to meet you where you are when they arrive. You do however have wireless transmitters that you can use. These transmitters can send 3 different signals: red, blue and green. There are small lights on the communicators that light up when a signal is sent from the alternate communicator. The task of the students is to design a method to be able to send directions and location information to their friend when he or she arrives at the train station. The details and precision necessary can vary according to the students’ ability and these concepts can also be used as talking points to lead the students into a discussion on issues related to wireless communication.

- **Methods and Procedure:**

Begin by presenting the asking the students about what they think is wireless communication. Where do they see it everyday, in their home, at school and other places? Create a list on the board of all the different things that use wireless signals. A short list of basics includes: cell phones, remote controls, radio and satellite radio, wireless internet (WiFi), Bluetooth devices, satellite television and many others. Create a list and ask the students specific questions about the different devices, such as can you use your television remote from school? No, so different types of devices have different ranges. Ask questions about which they think is faster, which can send more information in a shorter amount of time. Why satellites? Why would you use different types for different things? Let the students dictate the direction of the discussion and try to answer or lead them to answer the questions that arise. Why is wireless communication important? What else would be nice if we could make it wireless?

After this initial discussion, present the situation described above. Give them the maps and then run through a few exercises to lead them in the right direction for creating the needed communications protocol.

First, ask the students to write a paragraph that provides directions from the train station to another location on the map. They paragraph should be written in complete sentences and another student should be able to read it and be able to determine the location they directions lead to.

Second, ask the students to then translate the paragraph into the simplest words possible, preferably in the form of a list. What should arise here hopefully is that students use left, right and straight to create a directions list. At this point it might be helpful if it does not come up to bring up the concept of using north, south, east and west.

Lastly, ask them to create a communications protocol that codes their simple directions into the colors red, blue and green. Allow them to try different methods and then critique each method. Several concepts can be explored here, including the concept of "handshaking", how does your friend know when one "word" has been sent? How could you expand so that you might also send the names of places along with directions? How does the number of signals possible change with they complexity of the signals, i.e. if west is coded as "blue, blue" versus if west is coded as "blue:green, blue:red , blue:red". They can calculate the number of possible signals from a given parameter set.

The discussion and issues raised could go in many directions that can either be guided by the teacher or the students. Which protocol is faster? Which allows for more information? Which one makes sure that the information received is correct, or allows for error checking? Which is easiest for humans to decode, and would this matter for say a computer decoding these signals?

Once the students have completed their tasks, ask them in small groups to write the code necessary to give directions from one point to another. Have them individually write the code and then pass it to their group member to see if they can translate it correctly to determine which location the directions would lead them to.

Once they are finished, ask them to take about 5 to 10 minutes to write down some observations in their science notebooks. What did they know about wireless communication before they began? What did they learn from the lesson and what else would they like to know about how signals are sent wirelessly?

- Assessment:. *Student Journal and How-to-Essay*

- Keywords: Wireless Communication

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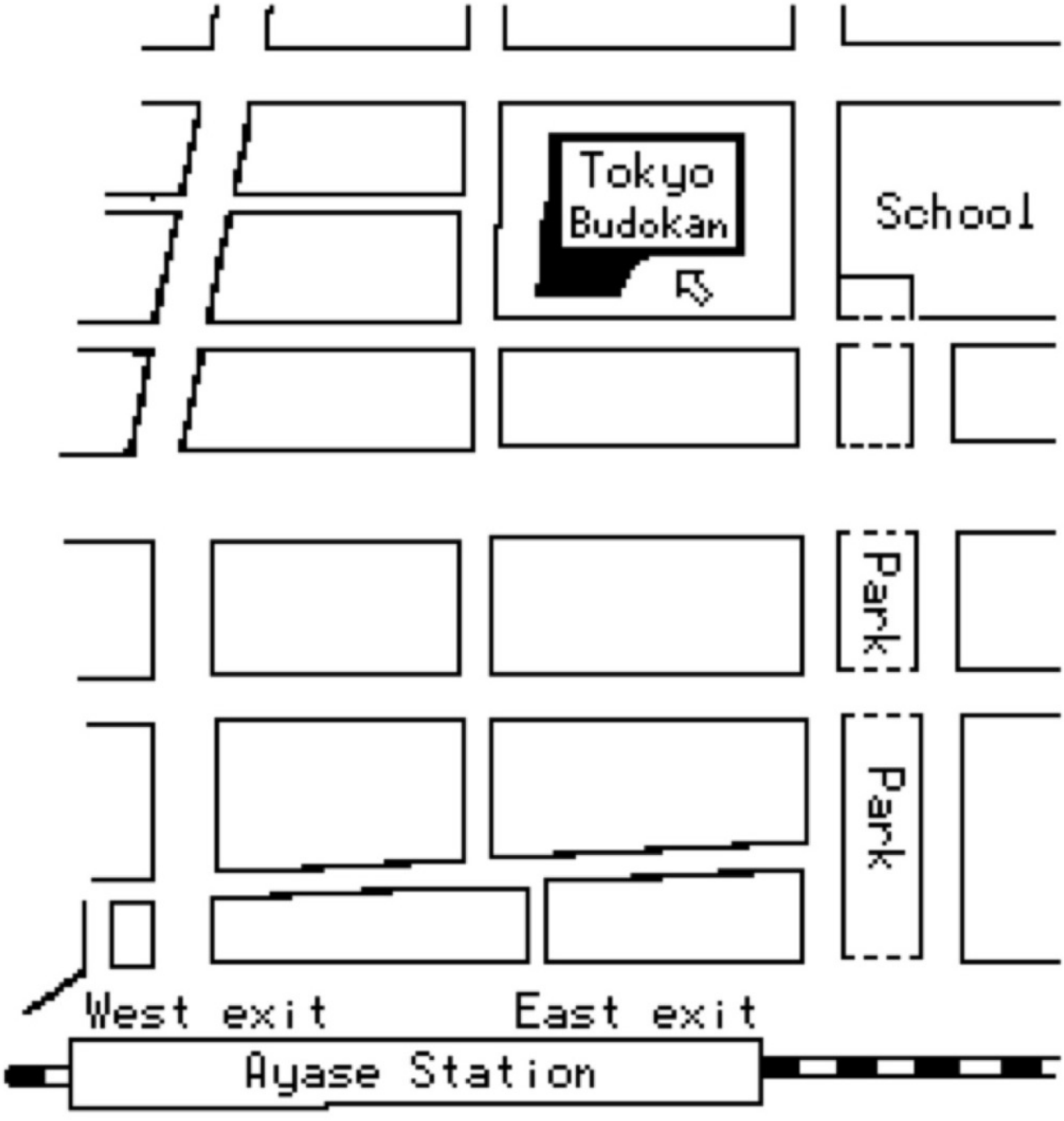
Tokyo
Budokan
School
Park
Park
West exit
East exit
Ayase Station