Pepco STEM Club – After School

Introduction

Welcome to *Pepco's STEM Club – After School* with a focus on ***Urban Infrastructure***! During this course, students will engage in a variety of opportunities where they explore many of the fundamental concepts dealing with urban infrastructure - what it is, what the major elements of the various urban infrastructure systems are, how each works, and how we as designers and users interact with the different infrastructures. More specifically, students will be learning about the infrastructures of transportation, water and waste, energy, communication, and sustainability.

Learning opportunities for students will take the form of hands-on activities, reading passages, video segments, interactive simulations, small and large group discussions, as well as individual projects and reflective writing pieces in their STEM journals. In this course, students will design and construct a model city that incorporates each of the different infrastructures they will have studied. Students will also have the opportunity to explore careers related to the urban infrastructure.

There are five modules in this course, each of which includes facilitator's notes, correlations to appropriate Next Generation Science Standards (NGSS), a materials list for each activity, inquiry-based activities from which to choose, and suggested projects and journal reflections for students.

Notes

- Each student should have a STEM Journal to use for all of his or her activities.
- Safety procedures should be reviewed at the beginning of the course and before each activity as necessary.
- We have provided a number of different inquiry-based activities for you to choose from in each module. You are not expected to undertake all of them with your students. Choose activities to fit your students, goals, resources, and schedule.
- Some activities can be conducted outside.
- Each module includes inquiry activities done using technology.

Scientific Inquiry

The goal of Pepco's STEM Club – After School is to build a love of inquiry; there is no expectation of detailed written analysis or assessment in the activities. Understanding

can be built through a multitude of experiences along with rich and stimulating discussions about science and engineering concepts and practices.

We have provided some suggestions for guiding student thinking, but not step-by-step instructions. However, to make the modules even more effective, we suggest the following:

- Data should be student-driven. Students should determine on their own what data they need to collect, how to organize it, and how to perform calculations.
- Leave design to the students. Where appropriate, students should be encouraged to design the activity or parts of the activity, or to modify the activity rather than having a facilitator tell them exactly what to do, in order to engage students in the engineering design process.
- Encourage students to use evidence. Ask students to use evidence, experience, and logical reasoning to come up with explanations on their own first before revealing any information.
- Encourage questions. Students should feel safe to ask questions, figure out ways to answer their questions, identify problems, and pose solutions to problems.
- Foster connections. Help students to connect concepts and activities to things they are doing in school, to everyday life, and to current events.

Background Information

We recognize that each club facilitator has different background knowledge. We have included some background information with each module, along with Web links to additional information. For general information on urban infrastructure, we suggest the following Web sites:

- Department of Transportation
- Digital Age Transportation
- Transportation in the United States
- How Stuff Works: Urban Waste Water Systems
- Grand Challenges of Engineering
- Smartgrid.gov
- Electric Power Transmission
- Wikipedia Portal: Telecommunication
- History of Communications

Objectives as well as appropriate core ideas and scientific and engineering practices from the Next Generation Science Standards are listed for each module.

Activity Safety

While the activities in Pepco's STEM Club – After School *Urban Infrastructure* are relatively safe, as with any type of inquiry experience, it is important that club facilitators and students always take proper safety precautions.

- Identify any students with allergies or medical concerns.
- Students and facilitators should wash their hands at the end of every activity.
- As with any inquiry experience, students and facilitators should never put anything in their mouths, including their hands, unless the directions explicitly say that it is okay to do this.
- Be aware of possible slippery floors when water may be spilled. Keep a towel or mop handy.
- When working outside with students, always be aware of the surroundings and what individual students are doing. Follow school regulations for taking students off-campus.