Unit Title: COMPUTER NETWORKING TLA

Designed by: Mark Kaufman and Joe McCade   **Grade Level(s):** 6-9
Time Frame: 20 hours

Stage 1: Identify Desired Results

Link to Content Standards:
1. TfAAP:…each student will be able to design technological systems
2. National Educational Technology Standards (NETS) project, Technology research tools: information literacy.
3. PA Science and Technology Standards 3.5.10.B.4: Demonstrate an understanding of computer networking by modeling, constructing, or assembling its components.

In order to create a coherent curriculum, units must be logically related to form a course of study.
Course name: Communication Systems   **Course goal(s):** Students design, build and test a variety of communication systems
Relationship between course goal(s) and this unit: Computer networks are one of many communications systems students will design, build and test.

Truly significant technological content has parallel process and knowledge components and occurs across appropriate contexts. Briefly explain this interaction for the unit:
Information, the way it is created, stored and transmitted has changed dramatically because of computer technology. Connecting computers or networking provides some of the most significant, powerful and important changes in information technology. To understand technology one should understand computer networking. Computer networking, like most of technology, should not be experienced solely in a static, non-participatory way. Designing, building, using and trouble shooting computer networks are important experiences in the "understanding" of computer networks.

What are the overarching understanding(s) desired for each of the dimensions of technology?
1. **Design:** Students will design local area network (LAN) for use in the technology lab.
2. **Develop and Produce Products and Systems:** Students will build and test the local area network (LAN) they design.
3. **Use and Manage Technology:** Students will test the various local area networks they designed and built to compare their cost, performance, maintainability, reparability and flexibility.
4. **Assess the Impacts and Consequences of Technology:** Students will understand the far reaching impacts of the computer networks and will account for disposal/recycling strategies when designing computer networks.
5. **Nature and History of Technology:** Students will understand how and why technological standards (particularly communication standards) develop.
6. **Connections**: Students will conduct research to learn about computer networks. This will help them understand the important role networking plays in supporting other technologies.

Stage 2: Determine Acceptable Evidence

What evidence will indicate that students understand computer networking?
This TLA, like most, requires a range of student knowledge and abilities. As a result it will require a range of assessment techniques. Students will experience the processes of technology by designing, building and testing local area networks (LANs). Observing students actually doing the activities is the best way to assess this process-oriented learning. Acceptable criteria can be communicated in performance rubrics. Understanding technology goes hand in hand with doing technology. Students should learn about networks, like what they are, why the are used, how they effect us, etc. This knowledge can be assessed by traditional test, by student reports or student presentations. Once again, it is essential to define clear criteria before the activities began. Appropriate Rubrics are in the attached lesson plans.

Stage 3: Plan Learning Experiences and Instruction

Supporting Lesson Plans:
1. Computer Networking Concepts
2. Building Computer Networks
3. Analyzing Computer Networks

- **Theme/Topic/Connections:** This networking activity can be part of either a communications or an information theme. Prerequisite learning includes an understanding of communications and information systems. It will also require information literacy skills and draw upon the student's abilities to solve problems, work in groups and think critically.

- **Context/Situation:** The students are part of a design team that is bidding on a computer-networking job for the technology lab. Each design team must present its bid to a mock school board composed of teachers and parents. Criteria for selection will include cost, performance, reliability, maintenance requirements, disposal costs, and ease of upgrade.

- **Challenge**: Students will prepare and present a bid for networking or re-networking their school. In the course of preparing their proposal the will: a) collect information about computer networks, b) design various networks, c) build the networks they design, d) test local area network (LAN), e) evaluate their various options and prepare and present a proposal.

- **Criteria/Parameters**: **The process to be followed in completing the problem-solving activity in terms of the technological method:**

  Understand the Problem: The first step will be to collect information**.** Students will work with a partner, use both written and electronic resources and answer such guiding questions as:
  1. How does the dictionary define a network?
  2. What is a computer network?
  3. List several applications for computer networks.
  4. Define and explain the following network terms: clients, servers, and peers
  5. Explain the following Network media – copper, fiber optic, and wireless
  6. Explain the function of a network interface card (NIC)
  7. What is a local area network (LAN)?
  8. What is a wide area network (WAN)? (See Lesson Plan: Computer Networking Concepts)
  9. Explain each of the following Topologies – bus, star, and ring (sketch each).

  Brainstorm Ideas: Students will sketch designs for three LAN topologies.

  Choose a Solution: Students will examine available supplies and equipment in order to select the best two alternatives for the LAN (Bus and Star).
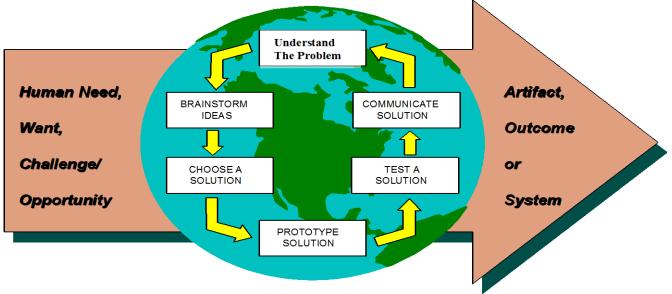
  Prototype the Solution: Students will construct each of the LAN topologies.(See Lesson Plan: Building Computer Networks)

  Test the solution: Testing and further research will help students determine the best design based upon the criteria of cost, performance, reliability, maintenance requirements, disposal costs, and ease of upgrade. (See Lesson Plan: Analyzing Computer Networks)

  Communicate the Solution: Each team will sell its design to the mock school board. They must be prepared to explain their recommendation on the basis of the predetermined criteria (see test the solution above).

- **Resources**: The following materials and equipment are needed:
  - Computers with Internet access or suitable substitute to facilitate research on networking several references are listed in the attached lesson plans but many suitable substitutes exist
  - 4 or more Computers with Network capable operating systems and network software (even 486's will work for this)
  - Communication protocols preset by the teacher and network interface cards capable of accepting RG58 or RJ-45 cables
  - 3 or more RG58 Coax cables with BNC connectors and RG58 Coax T units with BNC connectors and BNC terminators or caps
  - 3 or more RJ-45 cables

- An Ethernet hub with at least four ports

* The Technological Method/Process (The Human Created & Controlled World)