

PREPARATION AND DEVELOPMENT ACTIVITIES FOR PRE-SERVICE AND IN-SERVICE TEACHERS

The following eight activities suggest ways to explore the uses of laptops for science and math teaching. These activities can be followed independently or adapted by instructors or facilitators in a pre-service methodology course or a professional development course. The preparation and development activities encourage all teachers to review and take advantage of the 1999 Toshiba/NSTA Laptop Learning Challenge exemplary lessons and to carry out those lessons and ideas with K-12 students. The 20 lessons are available on the Laptop Learning Challenge Web site and CD-ROM.

As you review the lessons and the preparation and development activities, focus on techniques that affect teaching and learning. Think about ways to make your own teaching more interesting and effective. Question how students learn, what activities are motivating, how to handle information in various ways, how to promote understanding of science concepts, and how to assess success.

Address principles of teaching and learning in multiple contexts. By analyzing laptop investigations as part of pre-service teacher preparation and in-service professional development, teachers can further explore principles of pedagogy. For example, consider a student team using probes to gather and graph temperature data. These students must cooperate, discuss observations and interpretations, build a consensus, express ideas, test explanations, and articulate their understandings. As you review these preparation and development activities and the exemplar lessons, try to identify connections to lessons in science and other subjects.

Activity 1: Comparing Laptops to Desktop Computers

Identify similarities and differences between laptops and desktop computers, for both students and teachers. List the advantages of laptops, using specific examples. Describe some of the limitations of laptops.

From the Laptop Learning Challenge Web site or CD-ROM, review the Teaching with Laptops: Laptop Rationale section, which gives rationales for using these computers and examples of laptop advantages as seen in the exemplary lessons.

ASSIGNMENT

- 1A. State a rationale of your own for using laptops for science instruction in your choice of grade level and school setting.
- 1B. Present an argument for why you would or would not spend a windfall of \$5000 in technology support for teaching.

Activity 2: Accessing Resources

ASSIGNMENT

- 2A. Find and evaluate five Web sites for use by students in your choice of grade level and content.
- 2B. Analyze the skill required by students (in your choice of grade level) to perform the following tasks: use laptops, search for a topic on the Internet, ask useful questions of experts, gather and organize data, and interpret information. Describe how a teacher can facilitate success for these students.
- 2C. Describe the teacher's role as facilitator in at least two of the exemplar lessons. Comment on ways to improve or adapt the example for local use.

Discuss opportunities and responsibilities when accessing Internet resources and communicating with experts. From the Laptop Learning Challenge Web site or CD-ROM, read the Teaching with Laptops: Classroom Management suggestions related to facilitating email communication with experts. Generate additional suggestions through discussion with colleagues. Review one or more of the exemplary lessons in which students access the Internet.

Activity 3: Gathering, Organizing, and Interpreting Information

Consider the advantages and limitations of computers, in contrast to traditional methods, for gathering observational data, maintaining electronic logs, organizing data in files, and interpreting information displayed in tables and graphs.

Review kinds of data, appropriate ways to organize information, graph types, and data interpretation. Discuss common challenges for K–12 students such as distinguishing between and deciding when to use bar graphs and line graphs, and understanding the effect of numeric intervals on the impact of a graph. Describe advantages to the student of getting immediate feedback provided by data processed and displayed on laptops during a science activity or investigation.

Review one or more exemplary lessons from the Laptop Learning Challenge Web site or CD-ROM. Discuss ways that students gathered, organized, and interpreted data in that lesson.

ASSIGNMENT

- 3A. Demonstrate the ability to operate a laptop for gathering data. Connect and operate instruments interfaced with a laptop, and demonstrate how to organize and display the information.
- 3B. Design an activity for students in your choice of grade and content that involves collecting data for investigative purposes. Plan how to guide students in organizing and interpreting the data.

Activity 4: Inquiry in Interactive Environments

Consider students' cognitive levels and the user's interactions with technology. Describe the roles of laptops during science inquiry activities. Discuss how the roles change from elementary to high school. Discuss one or more of the exemplary lessons in the context of inquiry.

Compare two exemplar lessons from the Laptop Learning Challenge Web site or CD-ROM. Note the roles of the laptop, grade suitability, student input, control and/or empowerment, requisite technology skills, and the "invisibility" of technology. Suggest variations for another context or setting, and offer other comments.

ASSIGNMENT

- 4A. Plan instruction of at least one lesson in which laptops are integrated into student-centered activities.
- 4B. Observe students using laptops in a science class, or teach the lesson you planned in Assignment 4A and videotape the session for analysis. Report your suggestions for improvement or alternate strategies. Submit your videotape with your report.

Activity 5: Student Communication and Productivity

ASSIGNMENT

- 5A. Use a presentation program to produce a lesson for your choice of grade level and content. Include elements that provide information transfer, directions for a quick hands-on activity, questions that promote thinking, and assessment. Present your lesson using a laptop connected to a large screen monitor or projector. Report on the student reaction to your lesson.
- 5B. Identify ways that students can design and present their own electronic presentation using a laptop computer.

Find out about collaborative projects in which students communicate via videoconferencing, Web sites, and/or email. Consider the ways students can use laptops in the writing process. Review guidelines that help students produce their own multimedia production to report on an investigation or to present information. Research the long-term learning benefits of student produced multimedia presentations.

Activity 6: Assessment Opportunities

Give examples of assessment strategies that involve monitoring student work and using rubrics. Note evidence of learning, carrying out performance tasks, contributing to student portfolios, and using traditional testing. How can the laptop be used to make assessment easier, and to track and store data? Consider the use of photos, pictures, and drawings to present problems.

ASSIGNMENT

- 6A. Select two exemplary lessons and list the ways students are assessed for learning, productivity, skill mastery, and other evidence of growth in science and mathematics. Discuss specific ideas to enhance the assessment opportunities for one of the lessons. Describe the advantages of a laptop in the assessment process.
- 6B. Demonstrate the ability to use a file program and word processor to record and store traditional assessment results.

Activity 7: Management Strategies

ASSIGNMENT

- 7A. Write a brief proposal for a grant to acquire laptops for your ideal science teaching assignment. Include a well thought-out plan for addressing management issues.

Identify potential challenges or problems when using laptops, in managing instruction, equipment, and logistics. Propose ways to meet challenges or solve problems. Discuss your thinking by email with a colleague. Add to the strategies suggested in Teaching with Laptops: Classroom Management on the Web site or CD-ROM.

Activity 8: Teacher Productivity and Reflection

Identify the uses of laptops by teachers for professional productivity. Reflect on specific teaching techniques and on how students learn. List skills you already possess that involve using a laptop, and identify three more you wish to learn.

Discuss with a colleague how to use a digital camera with a laptop to gather and incorporate visuals into a pictorial-based lesson and/or test. If possible, try the camera and share the results.

ASSIGNMENT

- 8A. Demonstrate the ability to set up a file program or spreadsheet to record student work.
- 8B. Cite at least five Web sites that are useful resources for a teacher. Describe a situation when a laptop would be particularly advantageous when accessing such Web sites.
- 8C. Design an investigation of one aspect of your teaching that can be carried out using a laptop. Possible investigations are: What "show-and-tell" science and math items do students bring to class over several months, and how can the teacher facilitate sharing? How effective is a rubric in tracking student performance observed during science activities?