Instructional Technology

Ideas and Resources for Oregon Teachers

Oregon Department of Education

Office of Curriculum, Instruction, and Field Services

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This booklet was produced by the Oregon Department of Education for distribution to Oregon public schools, school districts, and education service districts. Additional copies are available from Barbara Slimak, Oregon Department of Education, (503) 378-3600 ext. 4498 (or e-mail barbara.slimak@state.or.us).

Contents

What is Instructional Technology?

For the last several years, schools' primary goal for technology has been to equip classrooms with computers and to become connected to the Internet. With few exceptions, this goal has been accomplished and all of Oregon's classrooms now have access to technology. However, access should not be an end in itself. It should be the beginning.

Technology can be used in many ways in today's classroom. It can be used to conduct research on the World Wide Web and provide access to seemingly unlimited resources. Technology can be used to analyze the results of experiments, inputting data into a spreadsheet and graphing the results. It provides the opportunity to communicate with peers and experts around the world through e-mail and video conferencing. Technology also makes it possible for students to demonstrate their understanding in ways other than traditional written tests and reports.

When referring to the use of technology in schools, it's important to distinguish between two major functions.

- **Information technology** is technology that deals with the management of information not directly related to instruction. This technology can be used for student records, assessment data, scheduling, payroll and finance, etc.
- **Instructional technology** (sometimes referred to as "educational technology") is technology used to support teaching and learning. Keeping in mind that technology is one of many tools that teachers have at their disposal, it is important to remember that instructional technology should add to instruction, not replace it.

Instructional technology should also enhance and extend learning. It is necessary for teachers to ask themselves, "Will the use of technology make this lesson better? Will it facilitate student understanding? Will students' capacity to demonstrate their understanding increase because of it?" Asking these questions will help determine when using instructional technology is appropriate, and when it is not.

Examples of Instructional Technologies

When most people think of technology, their first image is of a computer. Certainly computers are the primary technology available in schools today. Using computers and multimedia software, students can create presentations that, unlike their paper and pencil counterparts, incorporate text, graphics, video, and audio. This capability makes it possible for students to include images of documents, places and people central to the concepts they are studying. Students can also organize and present what they have learned in formats that support their learning styles. **Computer-based laboratories** use probes which, when attached to the computer, allow students to measure and graph variables such as temperature, force, light, and pH, and to analyze the relationships between these variables. But technology is more than computers.

Digital and video cameras provide students the opportunity to create a photo documentary of their learning. For example, when researching the water quality of a nearby pond, students can take pictures of the pond and its surroundings to provide evidence of factors that may impact the health of the pond. Additionally, pictures can document experimental procedures used in analyzing water quality. Traditional cameras can also be employed for this purpose, with **scanners** used to input the photographs into multimedia presentations.

Calculators are a form of technology that have been in classrooms for some time. Calculators make it possible for students to look for patterns using large numbers and pose and solve complex problems that would be too time consuming to do by hand. **Graphing calculators** take this process even further by providing students with multiple representations of mathematical concepts. Data entered into the graphing calculator can be represented numerically, graphically, and symbolically. This makes it possible for students to visualize problems and use these visualizations to better understand mathematical concepts.

Even everyday technology such as tape recorders can be used to enhance and extend learning. Students can develop an audio interpretive tour of the nature trail behind their school for visually impaired students. The oral history of a community can be documented for a social studies research project. A student's reading fluency can be recorded for use in a portfolio.

Instructional Technology In Action

Knowing how and where to start using instructional technology can be the hardest part. "Connecting Curriculum and Technology," a document published by the International Society for Technology in Education (ISTE) offers just such a starting place. It provides lessons at K-2, 3-5, 6-8, and 9-12 that integrate technology in English, math, foreign language, science, and social studies. Each of these lessons includes a list of software, hardware, and web sites as well as assessment ideas. Multidisciplinary resource units are also available at each of the grade clusters mentioned above, along with the necessary resources.

With ISTE's permission, we have reprinted several of these scenarios that demonstrate the use of instructional technology in the classroom. The full array of scenarios, lessons, and units can be accessed on ISTE's web site at **http://cnets.iste.org/index2ns.html**

Scenario 1: *Animals and Their Sounds*

- **Grade Levels:** K – 2
- **Technology Profile Performance Indicators:** 1, 2, 3, 4, 8, 9
- **Subject Areas:** Reading, Science
- **Source:** Sharon Fontenot, Prien Lake Elementary School, developed this lesson for a Louisiana Challenge Grant Leadership Program, Louisiana Tech University.

While every child may not be able to see animals in the wild, every child can see, hear, and learn about wild animals through multimedia technology. In Sharon Fontenot's class at Prien Lake Elementary School, students learn to identify polar bears, lions, and other wild animals through images, video clips, and sounds on the Wide World of Animals CD-ROM. The teacher models the creative use of technology by making a tape recording based on information from the CD-ROM, incorporating her own voice to fit the group's needs.

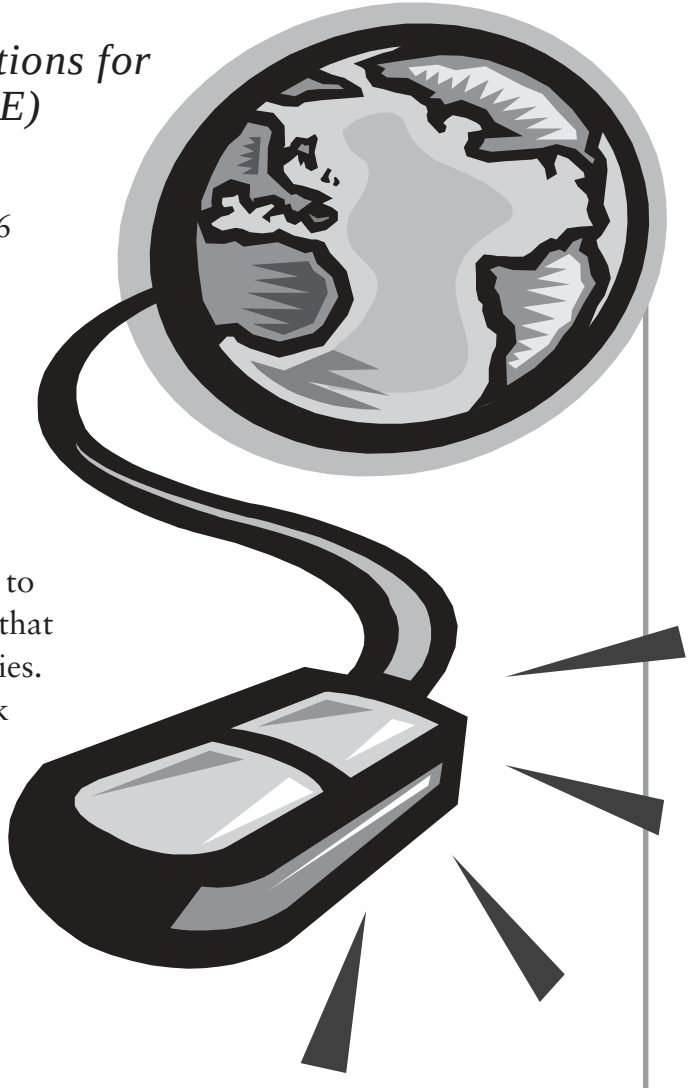
Students practice reading and listening skills by answering questions that encourage them to think about both the science and social living issues related to these animals. Where do these animals live? What do they eat? Why do some have thick fur? How do they interact with each other?

Students create their own stories about what they have learned using Kid Pix, a software program that allows them to make their own pictures of the animals, assemble them into slide shows, and print out their own books to share with classmates and family. The teacher videotapes the students' activities as part of their assessment and to share with students and parents.

Scenario 2: *Global Learning and Observations for a Better Environment (GLOBE)*

- **Grade Levels:** 3 – 5
- **Technology Profile Performance Indicators:** 2, 3, 4, 5, 6
- **Subject Areas:** Science, Social Studies
- **Source:** NASA Classroom of the Future Program.

Ms. Smith and her class have made extensive use of online resources, such as Exploring the Environment (ETE) (found at **http://www.cotf.edu/ete**) and Global Learning and Observations for a Better Environment (GLOBE) (found at **http://www.globe.gov**). She uses ETE to access classroom tested problem-based learning modules that extend and sometimes replace her old paper-based activities. These self-contained resources have provided a new spark of vitality in her science and interdisciplinary classes where students grapple with real-world issues and current data.



Using the GLOBE structure, Ms. Smith has students collect information from environmental observations around the school and vicinity, report the data to a processing facility through GLOBE, and use global images created from their data to study local environmental issues. The students have been contributing to an environmental database used by research scientists to improve our understanding of the global environment.

Recently, her students used GLOBE and other electronic resources to research a hot local issue. The community was debating whether to allow a biotechnology firm to locate nearby. Her students chose to analyze this issue very carefully. Students working in groups engaged in collecting and analyzing data about the proposed plant. Ms. Smith set forums in the class so that the students could present their findings and engage in debate. Students then created web pages to present their findings and arguments to the community. She reports that because of the authenticity and relevance of the issue, her students were even more engaged as they used technology in researching the issues. Parents were pleased to see their children's work on the school's web site, and viewing the materials at home helped parents feel closer to what the students did in school.

Scenario 3: *Using Technology to Learn about Rocks and Minerals*

- **Grade Level:** 8
- **Technology Profile Performance Indicators:** 4, 5, 6, 7
- **Subject Areas:** Science, Social Studies
- **Source:** Hemmer, Jeanie. (1998) Lakeisha's Year in Eighth Grade: Technology Integration Vignette, Part 3. *Learning and Leading with Technology. 25 (7), 27-31.*

Lakeisha's eighth-grade class began a unit on rocks and minerals. They explored topics using CD-ROM encyclopedias and stored the information they found and results from their laboratory sessions, including a weeklong rock simulation program, in their databases. When their studies were complete, Mrs. Perkins helped the students create HyperStudio presentations to share with the class. After she found an Internet site called "Ask a Geologist," Lakeisha and her classmates were able to e-mail questions about rocks and minerals to the geologists who were sponsoring the site. Lakeisha and her friends were fascinated with the information they received on rocks and minerals in their native area. Lakeisha's science teacher organized a local geologic dig to help students begin their own rock and mineral collections.

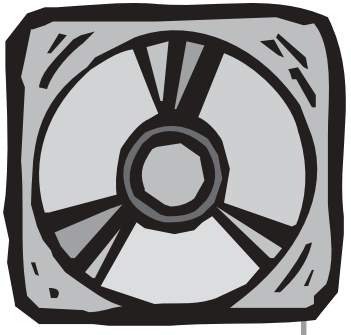
Scenario 4: *Presidential Elections*

- **Grade Levels:** 9 - 12
- **Technology Profile Performance Indicators:** 5, 7, 8
- **Subject Areas:** Social Studies, Language Arts, Mathematics
- **Source:** Based on a lesson created by a Southern California teacher and presented in a class at California State University, Los Angeles.

The U.S. system of presidential elections can be a mystery for many citizens. Teaching middle school or high school students about the Electoral College can be quite a challenge. Mr. Sanchez, a high school social studies teacher in southern California, developed an activity for his students that involves election data from the closest presidential election in history — the 1960 election between John F. Kennedy and Richard M. Nixon. This activity helps students understand the Electoral College and some of the strategies used by presidential candidates. Complete, state-by-state election results can be found at this web site **www.geocities.com/CapitolHill/6228/**. [Editor's note: This activity could be expanded to include more recent election data, for example, comparing and contrasting the results of the 1960 election with those of the 2000 election.]

Mr. Sanchez divides his students into groups and gives each a spreadsheet containing data from the 1960 presidential election. The spreadsheet contains the popular and Electoral College results from every state and territory. Formulas at the bottom of the columns calculate the total number of popular votes and Electoral votes for each candidate.

The groups are asked to conduct a series of investigations by manipulating the spreadsheet data. Students have printouts of the original data and the original data file on disk so that they can restore



the spreadsheet after each manipulation. The questions they investigate are: "Can you change the data so that Mr. Nixon wins the election rather than Mr. Kennedy?" "Can you change the outcome of the election by changing the election results in only one state?" "Two states?" "Three states?" "Can you change the popular vote so that one candidate wins the popular election but loses the Electoral College results?" "Can you change the popular vote so that the same candidate loses the popular vote but wins the election (via the Electoral College results)?" "What is the fewest number of states you can change to have one candidate win the popular vote but lose the election?" These "What if?" activities help students gain an understanding of the Electoral College.

Finally, the groups prepare a multimedia report on the 1960 election using HyperStudio. These include pictures of the candidates, charts and graphs from the election (e.g., **www.multied.com/elections**), and a discussion of their spreadsheet manipulations.

Technology and the Standards

There is little doubt that students in Oregon's classrooms today will need to be technologically literate in order to be successful in the 21st century. The jobs in which today's students will be employed will require that they be able to research, analyze, communicate, and create using technology. It is incumbent upon schools to prepare students for these responsibilities.

As technology filters down into every aspect of our society, it is essential that students not develop technological skills in isolation. Technology, more than any other discipline, has the ability to be integrated throughout the curriculum. By providing access to information, opening pathways to communication, and facilitating personal understanding, technology supports learning in all subjects.

The state of Oregon has not established specific content standards and benchmarks in technology. Nevertheless, technology plays an essential role in a student's education. To that end, the following Common Curriculum Goals* have been established.

**Common Curriculum Goals define the course of study used in all Oregon school districts from kindergarten through grade 12.*

Oregon Technology Common Curriculum Goals

Adopted by the State Board in March 2002

- Demonstrate proficiency in the use of technological tools and devices.
- Select and use technology to enhance learning and problem solving capacity.
- Access, organize and analyze information to make informed decisions, using one or more technologies.
- Use technology in an ethical and legal manner and understand how technology affects society.
- Design, prepare and present unique works using technology to communicate information and ideas.
- Extend communication and collaboration with peers, experts and other audiences using telecommunications.

National Educational Technology Standards for Students

National standards in technology for both teachers and students have been developed by the International Society for Technology in Education (ISTE), in collaboration with a wide variety of curriculum and educational organizations. Below are the standards developed for students. To view the National Educational Technology Standards for Teachers (NETS-T) visit: **http://cnets.iste.org/index3.html**

1. **Basic operations and concepts**
   - Students demonstrate a sound understanding of the nature and operation of technology systems.
   - Students are proficient in the use of technology.
2. **Social, ethical, and human issues**
   - Students understand the ethical, cultural, and societal issues related to technology.
   - Students practice responsible use of technology systems, information, and software.
   - Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.
3. **Technology productivity tools**
   - Students use technology to enhance learning, increase productivity, and promote creativity.
   - Students use productivity tools to collaborate in constructing technology–enhanced models, prepare publications, and produce other creative works.

4. Technology communication tools

- Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.
- Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.

5. Technology research tools

- Students use technology to locate, evaluate, and collect information from a variety of sources.
- Students use technology tools to process data and report results.
- Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.

6. Technology problem-solving and decision-making tools

- Students use technology resources for solving problems and making informed decisions.
- Students employ technology in the development of strategies for solving problems in the real world.

The Future of Instructional Technology in Oregon

The Department of Education is in the process of developing instructional frameworks for technology with the help of technology leaders, administrators, and teachers from across the state. Like the math and language arts frameworks, the framework for technology will offer a continuum of knowledge and skills for students from K-CIM. While not required, the framework can serve as a model for in-depth instruction in technology and provide a common understanding for teachers of critical content at each grade level. The hope is that with this tool, teachers can begin to see not only the technology skills students need to acquire, but the ways in which those skills might be integrated within existing content. We will be seeking public input to improve these frameworks once the first drafts have been completed.

Additionally, the Department would like to gather examples of effective uses of technology in Oregon's classrooms. To that end, we are making contact with schools, districts and ESDs and asking them to forward these examples to us. Our goal is to post some of these scenarios on the instructional technology page of our web site to provide the opportunity for Oregon educators to communicate effective practices in the use of technology. If you are interested in contributing to this effort please e-mail **sarah.martin@state.or.us**.

Technology Resources and Contacts

Many national and state organizations and agencies are involved in improving the integration of technology into teaching and learning, and have developed web sites to assist in this process. The list below represents a selection of these web sites.

Please note that inclusion of the following web links does not imply endorsement of either the reliability of the information presented or its suitability for a particular age group or grade level.

NATIONAL

Eisenhower Clearinghouse—http://www.enc.org/about/action
Eisenhower Math & Science Clearinghouse is a Department of Education funded national clearinghouse with 10 regional consortia that provides curriculum resources and professional development materials to improve K-12 mathematics and science teaching and learning. On this site find online lesson plans in science and math that integrate technology, as well as resources for using instructional technology in the classroom.

International Society for Technology in Education—http://www.iste.org
The International Society for Technology in Education promotes appropriate uses of technology to support and improve teaching, learning and administration in K-12 education. This site includes numerous technology resources for use in content areas, as well as information on distance learning and professional development. This site is also the home of the National Educational Technology Standards and the publication Learning and Leading with Technology.

McREL—http://www.mcrel.org
McREL, Mid-continent Research for Education and Learning, provides products and services, primarily for K-12 educators, to promote the best instructional practices in the classroom. On this site find a variety of resources for instruction, assessment and technology integration.

Tech Corps—http://www.ustc.org
Tech Corps was founded in 1995 as a national nonprofit that relies on volunteers to help build the technology infrastructure of our nation's schools. Currently, Oregon does not have a Tech Corps state chapter, but this site provides information on the chartering and volunteer process.

US Office of Educational Technology—http://www.ed.gov/Technology/index.html
On this site, the US Department of Education provides information regarding national technology goals, current legislation, grant opportunities, and research.

OREGON

OPEN—http://open.k12.or.us
The Oregon Public Education Network, in partnership with the Oregon Association of Education Service Districts, provides web-based resources for teaching and learning. This site includes the standards for all content areas, information on e-education, and practice scoring applications in writing and math problem solving.

Oregon School Library Information System—http://www.oslis.k12.or.us
This site offers tutorials for researching on the web, as well as on-line resources and suggested web sites for both elementary and secondary users.

NW Educational Technology Consortium—http://www.netc.org

NETC provides a variety of technology resources including models of technology integration into the elementary, middle, and high school classrooms **(classrooms@work)**, using videoconferencing for distance learning **(digital bridges)**, and research based resources for using technology with children eight and younger **(Early Connections)**.

Oregon Educational Technology Consortium—http://www.oetc.org

OETC is an organization dedicated to maximizing the value of educational technology to its members by working with software and hardware vendors to procure the most effective and appropriate technological resources at the lowest possible price. OETC's annual Instructional Technology Strategies Conference (ITSC) is an opportunity for educators to think, explore, and develop strategies to enhance student achievement through the effective use of technology. OETC also publishes New Century Schoolhouse, a newsletter distributed free to all member schools.

StRUT—http://www.open.k12.or.us/strutor/whatitis.html

Students **R**ecycling **U**sed **T**echnology or **StRUT** is a program incorporated into schools where students take donated computers and computer components and upgrade them for use in schools. This site provides information on how to participate and who to contact.

Instructional Resources

The Internet provides the opportunity for both teachers and students to access resources beyond the walls of the classroom. The following sites can serve as a starting point for teachers as they begin to explore all of the possibilities that the Internet offers.

Please note that inclusion of the following web links does not imply endorsement of either the reliability of the information presented or its suitability for a particular age group or grade level.

INSTRUCTIONAL MATERIALS

Lessons in PC Use—http://www.fi.edu/qa96/meindex.html
This web page offers a series of lessons and demonstrations to engage young children in computer classes, even before they are readers.

MarcoPolo—http://www.wcom.com/marcopolo
The MarcoPolo program provides no-cost, standards-based internet content for K-12 teachers and classrooms, developed by content experts from organizations including NCTM, AAAS, National Geographic, and others. On-line resources include panel-reviewed links to top sites in many disciplines, professionally developed lesson plans, classroom activities, materials to help with daily classroom planning, and powerful search engines.

Rubrics—http://www.odyssey.on.ca/~elaine.coxon/rubrics.htm
Sample rubrics for use in writing, dance, drama, music, visual arts, group work, research, and many other areas are available on this site. Be aware that not all rubrics follow the same format.

The Gateway to Educational Materials—
http://www.thegateway.org/
This site uses key words and grade levels to access lesson plans, curriculum units, and other education resources available on the Internet in all content areas.

WWW CyberGuide Ratings—
http://www.cyberbee.com/guide1.html
CyberBee provides a guide for evaluating web sites being considered for instructional use. Criteria including speed, ease of navigation, and content help the user determine the appropriateness of a site relative to the instructional goals of the lesson.

WWW for Teachers—http://www.4teachers.org
4 Teachers is an indexed collection of online resources made by teachers for teachers, which includes information on professional development, technology tools, and integrating technology.

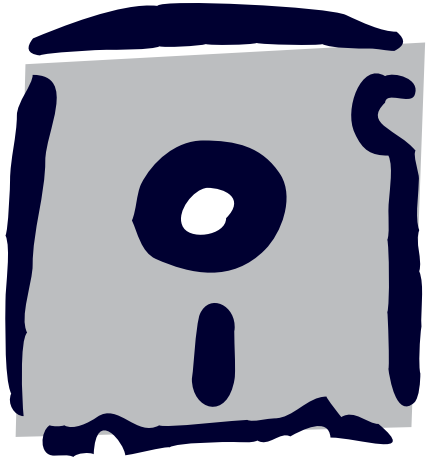
WebTeacher—http://www.webteacher.org/winexp/indextc.html
WebTeacher is a free, self-paced Internet Tutorial that provides basic and in-depth information about the World Wide Web. The Web Primer is a condensed version that provides introductory lessons for those just getting started. The full Tutorial offers in-depth information that will help teachers to use the Internet more fully.

SOFTWARE REVIEWS

California Instructional Technology Clearinghouse—
http://clearinghouse.k12.ca.us/c/@3S_0RMxU8J_i./search.html#Technology
This web site, designed as a resource to help educators identify electronic learning resources, allows the user to search for software by program title, subject area, grade level, and several other criteria.

The Review Zone—http://www.thereviewzone.com
This web site offers reviews of CD ROM materials in all major content areas as well as a "Best of" list.

Tech Learning Software Review Search—http://www.techlearning.com/review.html
Search criteria for software on this web site include content area, grade level and format. This site features comparative reviews which allow the user to look at the features, weaknesses, and strengths of similar programs side by side.



Educational Software Reviews—
http://www.unc.edu/cit/guides/irg-31.html
The periodicals listed on this page include reviews and evaluations of educational materials on CD-ROM or educational software packages, either as regular columns or as occasional feature articles.

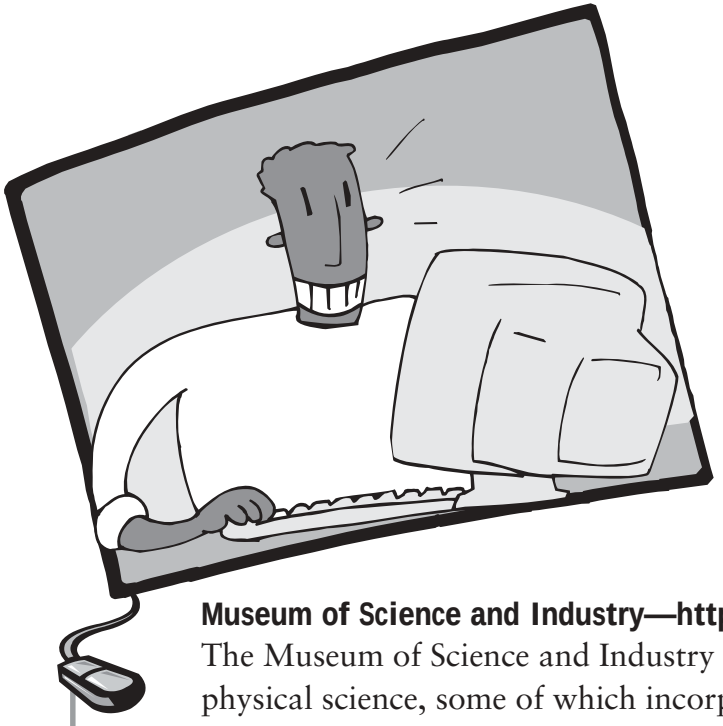
VIRTUAL FIELD TRIPS

American Museum of Natural History—http://www.amnh.org
This site offers interactive tours of several changing exhibits, as well as a link to the Hayden Planetarium. The "Museum Website for Kids" includes a paleontology site with facts, activities, and interviews with paleontologists.

The Field Museum—http://www.fieldmuseum.org
The Field Museum has a wide variety of on-line exhibits including a pictographic timeline and history of Sue, the largest, most complete and well-preserved Tyrannosaurus rex, and "Sounds from the Vaults," which allows students to "play" virtual instruments in the museum's collection using digital technology.

Franklin Institute Online—http://www.fi.edu/learning.html
This web site offers a variety of resources in science and math, including on-line explorations of scientific objects not on display at the Institute and open-ended math problems for middle school students in Algebra, Geometry, Number Theory, Measurement, and Statistics and Probability.

Louvre Museum—http://www.louvre.fr/louvrea.htm
Take a virtual tour of the Louvre Palace and Museum on this web site. The collections that can be viewed include Oriental, Egyptian, and Greek antiquities, sculptures and paintings, prints and drawings, and architectural views of the museum. QuickTime is required to view the artwork, but a connection for downloading is provided right on the site.



The Museum of Modern Art—http://www.moma.org
A selection of works from each of MOMA's exhibits (Painting & Sculpture, Drawings, Photographs, Architecture & Design, and Film & Video) is available on this site, some with audio commentary. Under "Educational Resources," you'll find "Art Safari," a program that allows students to examine a piece of artwork and answer question prompts, helping them look for clues about what's happening in the artwork and write stories about what they see.

Museum of Science and Industry—http://www.msichicago.org
The Museum of Science and Industry in Chicago offers on-line exhibits in earth, life, and physical science, some of which incorporate video and animation.

National Air and Space Museum—http://www.nasm.edu
This site offers comprehensive permanent and temporary on-line exhibits on flight and space. Two of the museum's online galleries, "Exploring the Planets" and "How Things Fly," feature science activities for the classroom.

OMSI—http://www.omsi.edu/
This web site provides information on exhibits, classes and teacher resources provided by the Oregon Museum of Science and Industry. View selections from the exhibits online and find links to web sites on topics related to the exhibits. In addition, access the Science Learning Network and visit museums worldwide.

National Civil Rights Museum—
http://www.civilrightsmuseum.org

This web site offers a virtual tour of the National Civil Rights Museum located in Atlanta. The museum presents a timeline of the civil rights struggle relating to African-Americans and concentrating on the seminal events of the 1950s and 1960s, including Brown Vs. the Board of Education and the use of the National Guard to enforce that decision in Little Rock, Arkansas. Also included are "The Voices of Struggle," short biographies of individuals who worked to affect positive changes in civil rights.

National Gallery of Art—http://www.nga.gov

The National Gallery lets users view its collection in a unique way, providing full screen images as well as detailed close-ups of objects from several viewpoints. Over 150 teaching resources are loaned free of charge to educational institutions, and these programs are designed to meet national standards in the visual arts. This site also features "NGA Kids," which offers kids the opportunity to explore and learn about pieces in the museum's collection.

National Museum of American History—http://americanhistory.si.edu

A wide variety of virtual exhibits are available on this site, from the restoration of the flag that inspired the "Star Spangled Banner" to "On Time," an exhibit that explores how Americans have measured, used, and thought about time during the past 300 years. The "Hands On History" room has some on-line activities for students including "You Be the Historian," where students examine some virtual artifacts from the Springer family to try and discover what life was like 200 years ago.

United States Holocaust Memorial Museum—http://www.ushmm.org
This site offers many on-line exhibits, two of which, "Kristallnacht" and "The Voyage of the St. Louis," include lesson plans and teacher resources. "The Holocaust: A Learning Site for Students" uses text, historical photographs, maps, images of artifacts, and audio clips to provide an overview of the Holocaust. This site is most appropriate for middle and high school students.

World Forestry Center—http://www.worldforestry.org
This site provides information on the exhibits at the World Forestry Museum, including exhibits on the history and importance of old growth and rain forests, as well as information on ordering Teaching Kits that include lesson plans, videos and hands on teaching aids. This site also offers a "virtual hike" on the Nagle Trail, teaching "hikers" through text and photographs about the ecosystem of the forest and the wide variety of plants that inhabit it.

For More Information

Your district Technology Specialist is an excellent source of information on local resources and technology applications. You can also call or e-mail the following Oregon Department of Education specialists if you have questions or suggestions about this booklet, or if you would like to recommend new links or report broken links.

Sarah Martin, Instructional Technology Specialist

sarah.martin@state.or.us ▼ (503) 378-3600 ext. 4447

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