Using Interactive Internet Sites in Teaching

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by

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Introduction

The development of computer-based technologies has been both advantageous and challenging for educators. In the span of just a few decades, the extensive increase in computing power, together with the rapid flow of electronic information via the Internet, has provided educators with tools that can increase student learning. Most schools today, at great expense, have installed computer labs with Internet access; and many schools have computers in the classroom.

As technological advances have continued, there has been a tendency to emphasize the technology itself and not to take the time required to think about the best ways to use the equipment. An often heard claim in education settings is that without the most recent technology and associated peripherals and software in the classroom, today's students will be ill prepared for tomorrow's reality. Although this statement is heard frequently when schools make budget requests, and though it is important that schools have current technology, most schools cannot afford to replace their computers at every technological advance. Thus educators must develop strategies to use
the equipment already in place to provide their students with the best possible learning experience.

The purpose of this fastback is to introduce teachers to interactive websites and to help them develop strategies that will increase student learning without having to upgrade the computer equipment already found in most schools. An interactive website is exactly what its name suggests, a web page that interacts with the user. The user enters information, and the web page responds. The next section defines the interactive website and its advantage over static websites. An example of an interactive web-based activity is presented along with how the activity can be incorporated into the curriculum. Methods for evaluating the activity also are presented.

The following section illustrates how to locate interactive websites on the Internet. The use of education portal search engines is emphasized, with guidelines on how to limit the search by subject, topic, or grade level. Also described is how to find lesson plans that incorporate interactive web activities. The fourth section depicts the format of many education sites with interactive web activities. This includes a teacher area that has ideas for educators, an explanation of the activity, links to national standards, and a teacher discussion board. Often there is a parent’s area that has a section of family material, tips for families, and answers to frequently asked questions. The final section illustrates several examples of web-based activities for various disciplines and grade levels and how they have been incorporated into the curriculum.
The Interactive Website

A major goal of educators is to provide students with a creative and meaningful learning environment. Since the early 1980s, educators have used computers to enhance learning; but it was not until the introduction of the World Wide Web into the classroom that students and teachers had the ability to explore information in a nonlinear way. The user would use a search engine to find a web page containing information on a certain topic and request a document from the server, and then the server would transmit the document to be displayed. The document could be text, a picture, and even an audio or video file. However, the process essentially was static because the files just presented information. The user was not able to interact with, enhance, or alter what was presented.

Interactive Defined

The current status of the World Wide Web is very different. Today, web pages can be made interactive by inserting small, portable pieces of code or programs to perform specific actions based on the response of the
user. This enables people to perform functions over the Internet, such as make travel reservations, pay bills, and order merchandise. In education, interactive web pages enable students to explore activities as diverse as manipulating mathematical equations, editing memos, or decorating the oval office.

One code that enables Netscape or Microsoft browser to support interactive web pages is JavaScript. By using JavaScript, the page is network independent and all interactions between the user and the local computer occur without accessing a network server. This is helpful when the user has a slow Internet connection. Once the interactive page is loaded on the user’s computer, it does not have to access the server as the student completes the activity.

Another method of creating interactive web pages is with a Common Gateway Interface (CGI). With a CGI, the user enters information onto the web page and sends the information back to the server. The server then processes the request and sends back the results. This is the method most businesses use to sell their products over the Internet. For example, when a traveler desires an airline reservation, the user has to send the request to the company’s server before the request can be completed. On education-based, interactive websites, a CGI is used when the data or amount of code required for the interactive activity is large and, therefore, it is more effective for the local computer to communicate with the server.

Currently the most popular programming language for creating interactive web pages is Java. The Java
programs most familiar to educators are interactive applications known as applets. By adhering to a set of programming conventions, these applets will run on any Java-compatible browser. Using Java, programmers can develop complex interactive applications for business, government, and education. Java offers the highest level of current interactive applications and must be compiled or translated into computer code. A Java compiler is a separate application and must be on the user's computer. However, when Java is fully integrated into the web page, it is as simple to use as a page with JavaScript or a Common Gateway Interface.

The Interactive Advantage

When the World Wide Web became prevalent in education, the advantages were stated in terms of enhancing learning beyond the scope of drill and practice and tutorial programs. Phrases such as problem solving, simulations, and discovery learning often were heard. Computers were connected to each other and to sources of information in text, audio, and video format. Students were able to exert control over their learning environment by choosing the paths of their learning according to their interest, experience, and need. Learning did not have to be linear. It now consisted of many sources of information connected by many pathways. There was not a set path that had to be traveled.

Although students had the freedom to move from one source of information to another according to their preferences, the sources of information were static. Websites
with interactive web pages are different. Students can actively participate in the web page by entering data, engaging in a simulation, working sample problems, examining outcomes, and playing educational games.

For teachers, a meaningful factor when incorporating technology into the curriculum is deciding if using technology is better than the more traditional methods. With the advent of interactive websites, this inquiry shifted to how do teachers take maximum advantage of the current technology. This does not mean that the technology is a panacea and should be used in all situations. Any educational tool has disadvantages in addition to its capabilities and benefits. When thinking about various pedagogical goals and methods, teachers always have to question and determine the best manner to teach a topic.

One problem with designing an interactive web page is that authoring may become quite complex. In the current technological environment, most teachers have had some experience designing their own web pages. The available authoring programs make the task quite simple, and well-designed pages can be completed in a few hours. Having an interactive web page, especially one that requires Java, greatly complicates the authoring process. Page development, instead of taking one afternoon, might require weeks to complete; and most teachers do not have the time or aspirations to program and test interactive web pages. Fortunately, there are educators and website developers who have designed and published interactive web pages for classroom use.

It should not be surprising that the available interactive websites vary in quality. This also is true of static
Websites. The goal of teachers is to find interactive web pages with appropriate content for their class, to evaluate the site for suitability, and to use only the sites that strengthen the curriculum and enhance learning.

**Interactive Web-Based Activities**

There are many interactive websites available for teachers in every discipline and at every grade level. The following two examples provide a fundamental understanding of the power of an interactive website and how it can be used in instruction. The first example, from mathematics, is found at www.calculator.com. The home page of the site has links to more than a dozen types of calculators. By clicking the “graphing” icon, the user is connected to a graphing calculator. Enter a function in the function box, and the graph of the function appears in the graph area. There also is a trace button that enables the user to move the cursor along the graph, and the “x” and “y” value of the point of the cursor’s position on the graph are presented. The user can graph more than one function at a time. After the original function is graphed, if another function is entered in the function box, the graph of the second function appears on the screen in a different color. The trace feature can easily be moved from one function to the other by the click of a mouse.

Mathematics teachers who have Internet access and a projection system in the classroom find this page to be an excellent tool for demonstrating graphing concepts. For example, an algebra instructor can demonstrate the
concept of slope and y-intercept by graphing a linear function, such as \( f(x) = 3x - 2 \). Then, by changing the y-intercept or the slope of the function, the students can observe how the graph changes. This is quite effective when both graphs appear on the screen simultaneously. Other concepts that are displayed easily are that two linear functions that have the same slope are parallel and that two linear functions that have slopes that are negative reciprocals are perpendicular. Students can then be assigned a guided project to explore linear functions. The students follow the directions, print the results from the website, and use a word processor to write their observations and conclusions.

Students in higher-level mathematics classes can use this interactive website to explore basic calculus topics. Students might be assigned a second degree or higher equation and use calculus to determine the location of maximums and minimums. After the students find these points on paper using the first derivative, they use the website to plot the graph and verify the results. Students then determine the tangent line to the graph at a particular point and use the website to graph the tangent line. The website verifies if the student is correct, and the student observes how the tangent line touches the original graph. Additional exercises can be accomplished using secant lines to verify how the value of the first derivative and the slope of the tangent line are equal. Another positive feature of this website is that it enables students who cannot afford a graphing calculator to enjoy its benefits if they have access to the Internet.
The second example of an interactive website is “Inside the White House,” which is found at www.nationalgeographic.com/whitehouse/whhome.html. The scenario of this site is that the student has been elected president of the United States, and the furnishings in the oval office should reflect the student and the student’s tastes. This site enables the user to personalize the oval office in five areas and to determine the American public’s impression about the choices. The five areas include a presidential portrait, a pet, a book, a desk decoration, and food. For the portrait, the program offers the student five choices of former presidents. There are links for each alternative that provide information about each option. Each of the other areas offers between three and five choices, and links from each relate how the option is connected to a former president. One of the more engaging descriptions is why a squirrel is a legitimate selection for a pet. It seems that Harry Truman enjoyed feeding the squirrels so much that they actually became more like pets than wild animals. This changed when Dwight Eisenhower became president, who enjoyed golfing on the White House lawn and had the squirrels removed to a nearby park. The students read these descriptions and make their decisions, and a picture of the Oval Office is decorated according to each student’s selections. After the choices are completed, a newspaper article appears critiquing each selection and analyzing the type of president the student will be. The article is personalized because the student enters his or her name at the beginning of the selection process and picks the name of the pet.
Evaluating Interactive Web Pages

When technology was first used in education, it was prophesied that the teacher would soon be replaced with a computer. Teachers would become obsolete and the computer would perform all required teaching functions. Soon it became apparent that the opposite was true. Using technology actually made the teacher's role more critical because the teacher had to evaluate the technology and incorporate the digital information into the curriculum in an appropriate and meaningful manner. Yes, well-designed technology-based products can increase learning; but in like manner, poorly designed products can hinder the learning process. Since the computer phrase, "garbage in, garbage out," also applies to incorporating interactive websites into the curriculum, the teacher is the gatekeeper whose responsibility is to filter out the garbage and use only what is effective.

Before educators incorporate interactive websites into the curriculum, the sites should be evaluated. One category of evaluation concerns whether the website functions properly. Before a page is published on the Web, all aspects of the page need to be tested to be certain the page operates as expected. The testing does not always happen, and many websites contain errors. Because developing interactive websites is complex, teachers should test all potential websites for functionality before using the site in the classroom. This includes all links and interactive functions. Also check for functionality on different types of computers with different software. Some interactive websites might run well on
one operating system with a certain browser and not function at all on an older operating system or a different browser. The teacher should know the minimal computer and software requirements for each website's page to run. At the very least, students should be informed about the location of available hardware where the website has been tested and has worked, especially if the students are assigned a task using an interactive page. Also remember that the World Wide Web often changes. Although every link in this monograph has been tested, there is no guarantee that the site will be at the same address or even available at a later date.

Other relevant features of interactive websites concern whether a site enhances the curriculum, supports the goals and standards of the discipline, and increases learning. Technology is only one of many tools in the educator's storehouse and should be used only when effective. If a website is used, teachers should be certain that the information is correct and current, well structured, and appropriate for the students. In addition, the website should be entertaining and enjoyable. A site that does not engage students will not enhance learning. Boring web pages are not accessed and do not stimulate a desire to learn.

A final consideration concerns the advertisements on many sites. Even the best interactive websites can be neutralized by commercial content. This is especially true with the use of pop-up ads that cover the screen when a student interacts with a web page. Some educators have had moderate success stopping these advertisements by installing ad-blocking software on their computer or network.
Locating Interactive Web Pages

Most teachers follow a prescribed curriculum in their class based on principles and standards developed by professional organizations. The challenge for educators is to find the best materials and tools for teaching the subject matter. For example, teachers will evaluate textbooks for each subject and decide which text is the most appropriate for the class. Finding possible textbooks is an easy task. To sell their product, publishers mail their texts to people who make the decisions regarding textbook adoption. Finding supplementary material is not so simple. Often, teachers spend many hours searching for additional material, such as handouts, worksheets, and web pages, that will amplify and strengthen the information found in the textbook. Although the most efficient method for discovering ancillary material is to obtain recommendations from other teachers, at times these recommendations are not readily available. Fortunately, when searching the World Wide Web for interactive sites, there are procedures that will help the teacher find what is available in a reasonable amount of time.
General Search Engines

When attempting to find information on the World Wide Web, most people use a search engine such as Yahoo (www.yahoo.com) or Google (www.google.com). These search engines may be used to locate interactive web pages on specific topics. The usual procedure is to type the topic plus the word "applet" or "interactive" in the search box. For example, when attempting to discover interactive web pages to help students learn the states and state capitals, a teacher used Yahoo Search and typed "US States and state capitals interactive" as her search parameters. She obtained more than 10,000 possible sites. Fortunately, Yahoo first displayed the leading results based on the best matches. The teacher was then able to read a short synopsis of the website and decide if it was worth the time to open the link and evaluate the page. Based on the search, the teacher found a game to match the states with the state capitals and an interactive puzzle of the United States. She also discovered two other sites with information about the 50 states that could be included in the curriculum. When educators search the Internet for a specific topic, they often locate unanticipated information that is also helpful.

The above example demonstrates both the benefits and disadvantages of general search engines. The initial benefit is that the search engine located more than 10,000 possible sites. The first inconvenience is that the search engine located more than 10,000 possible sites. This is analogous to receiving an evaluation where the same aspect of performance is listed as a positive by some and
a negative by other evaluators. It may be satisfactory that the search engine located so many potential sites, but who has time to review all the possibilities? Having the top 20 sites listed first is, of course, helpful; but suppose the site that would be the most beneficial for the class is number 60 on the list of web pages. In most instances, the teacher will not search the sites that far down the roster.

The negative of not having useful education-based websites in the topmost web results is often balanced by finding useful pages not specifically designed for educators. For example, the search of state and state capitals might yield data from the U.S. census. Although the teacher wanted to examine interactive websites, information from unanticipated websites might add to the class curriculum and increase student learning. Other unexpected results could include locating a site that has links to the web pages of state capitals. The students could access the city’s website and learn about the city, instead of just the city’s name. One of the enjoyable aspects of searching the Web is the worthwhile information that often is discovered.

Education-Based Search Engines

Instead of using a general search engine, educators can search for educational materials using a search engine that locates sites specifically designed for teachers and students. One such education portal is GEM, the Gateway to Educational Materials (www.gemininfo.org). GEM is a project of the U.S. Department of Education
that enables educators and others to access a variety of educational materials located on federal, state, university, nonprofit, and commercial Internet sites. From the home page, the user clicks “The Gateway” icon and is connected to the site’s search engine.

The search for educational materials may be accomplished using several methods. By using drop-down menus, the sites can be located using broad subject and narrower subject categories. For example, if the broad subject selected is mathematics and the narrower subject chosen is fractions, a list of educational materials regarding fractions would appear on the screen. The search can be refined by limiting the search by grade level. Options include selecting materials for pre-kindergarten, kindergarten, each grade level from first to 12th grade, community college, vocational education, higher education, and adult/continuing education. By selecting the required grade level, the search will eliminate sites that are outside the requested range. Further filtering also is available using keywords, the title, or a description. A final category of filtering that all educators can appreciate is the option to check a box that will cause the search engine to select only free resources. Obviously, GEM locates a variety of educational sites. If the user is looking specifically for interactive websites, he or she should type “interactive” in the search by description box.

One of the positive aspects of a GEM search is how the presentation of results simplifies the evaluation process. The initial list is similar to the format of the general search engines and includes the title, a link to the
site, and a short summary. What is different is the inclusion of a “more information” icon. By clicking the icon, educators get information about the title, description, appropriate grade level, subjects, keywords, audience, resource type, format, publisher, cost, and date created. Suppose 10th-grade English teachers at a local high school are looking for interactive material to enhance a unit about Mark Twain. They access the GEM search engine, enter “Mark Twain” in the keyword box, and select the 10th-grade level. The title, “Mark Twain in His Times,” and the related summary piques the interest of the teachers. By clicking the “more information” icon, the teachers discover that the site is located at the University of Virginia, is appropriate for grade 10, and contains texts, manuscripts, reviews, and images in interactive exhibits. Teachers then click the title and are connected to the site to further evaluate it.

Another helpful education portal is MERLOT, or Multimedia Educational Resource for Learning and Online Teaching (www.merlot.org). MERLOT was founded in 1997 by the California State University System and was joined in 1999 by Oklahoma State, the University of North Carolina, and the University System of Georgia. The site is designed for faculty and students in higher education. Although MERLOT has a well-designed search engine, most users seem to prefer browsing the materials using subject categories and subcategories. The home page has a list of the following subjects: arts, business, education, humanities, mathematics, science, and social science. When one of the subject icons is clicked, a list of subcategories for
that subject appears. The user then clicks one of the sub-categories to see the list of available materials. In a few instances, the subcategories have their own subcategories. The results include the title of the resource, the author, a short description, an evaluation rating, and type of resource. Types of resources include drill and practice, simulations, reference materials, tutorial, animation, case study, lecture, quiz, and collections. To connect to any of the listed resources, the user just clicks the resource’s title. When the search engine feature is preferred, select “advanced search” from the MERLOT home page and then limit the search based on the listed categories. Educators searching for only interactive sites can confine their search to simulations by indicating this item type in the appropriate box.

Anyone can browse the MERLOT collection, but only members can add material and make comments to help evaluate the material already available. Membership is free, and members are given the option of making their professional information available in a membership directory. To become a member, click the “join now” icon. The enrollment form requires educators to list only their last name and e-mail address. They may submit other optional information, such as their first name and primary area of interest. The data on the enrollment form is posted on each member’s profile within the MERLOT site and thus becomes shared information. After joining, MERLOT e-mails new members a password to the provided e-mail address.

There are education portals that specialize in interactive websites. Two of the most useful are Project
Interactivate (www.shodor.org) and the National Library of Virtual Manipulatives (matti.usu.edu/nlvm/nav/index.html). According to its website, the goals of Project Interactivate are the creation, collection, and dissemination of interactive, Java-based courseware for exploration in science and mathematics. The site has links to more than 100 interactive activities that are grouped according to the National Council of Teachers of Mathematics standards. In addition, there is a search engine for finding sites based on key words. An additional feature of this site is the resources for teachers that are available. For example, an educator that clicks the “Lessons” icon on the site’s home page is linked to lesson plans that incorporate the interactive activities. Each lesson plan provides the instructor with preparation instructions and suggested outlines. There also is a discussion section where teachers can exchange ideas and submit suggestions.

The National Library of Virtual Manipulatives also presents interactive websites for mathematics. The site is sponsored by Utah State University and was originally funded by a National Science Foundation award. The goal of this location is to develop interactive mathematics materials with a K-8 emphasis and to make the materials available on the Web. According to the project information page, the Utah State University team hopes to create a national library of interactive web pages that will enrich the teaching of mathematics and also be used for inservice and preservice teacher training. The site does have a basic search engine; however, the most efficient way to locate links to the virtual library is to use the site’s index matrix. The first column
of the matrix lists the following categories: Number and Operations, Algebra, Geometry, Measurement, and Data Analysis & Probability. The first row has the following grade intervals: Pre-K-2, 3-5, 6-8, and 9-12. By clicking the box at the intersection of the category and grade level, the user accesses a list of applicable activities by title and description.

An education portal that lists interactive websites for language arts and social studies, in addition to mathematics and science, is the Interactive Skill-Based Curriculum Activities and Games for Students (www.forsyth.k12.ga.us/sbeck/interactive_curriculum_sites.htm). This site does not currently have a search engine, but links are arranged according to their subject content. Categories include math, language arts, science, social studies, and K-1 alphabet and reading activities. For example, a social studies teacher could access this site and link to the list of social studies interactive websites. The teacher then reads the description of each site and evaluates the locations with the most potential. A site on this list often used by social studies teachers is Geo-Tour, one of the Geo-Globe interactive games (library.thinkquest.org/10157). Geo-Tour is a game that gives students clues to some of Earth’s most unusual landmarks, such as a reversing river, ancient cities, the world’s deepest lake, and the largest caverns. Teachers have used this game as part of their classroom activities and have also assigned Geo-Tour as homework.

The Educator’s Reference Desk

For more than 25 years, the ERIC website has provided educators with access to lesson plans, the ERIC
database of educational materials, a question archive, and many more tools to benefit teachers. A major revision occurred in December 2003 when the ERIC site became the Educator’s Reference Desk (www.eduref.org). The Educator’s Reference Desk is envisioned to be a door to all the reference materials that an educator may require. Currently, the site provides links to more than 3,000 resources, including Internet sites, education organizations, and discussion groups. Also included is a collection of more than 2,000 lesson plans that have been submitted by teachers from around the globe. Another feature of the Reference Desk will be an archive of answers to questions frequently asked by educators.

This site provides valuable information to educators who want to incorporate interactive web pages in their classroom. Through the discussion group, educators can communicate ways that they have used interactive web pages successfully. Questions can be asked and answered and sound curricula can be developed. As teachers develop their lesson plans, they can submit their ideas to the Reference Desk for publication and use by other teachers.

Perhaps the most important feature is that the ERIC database, the world’s largest source of education information, is still available. Educators will be able to search the database of more than one million abstracts of documents and journal articles to determine what has been written about interactive websites and any other topic in education.
The Format of Interactive Websites

Interactive sites should meet the needs of both the student and the educator. For example, there are sites that have superb interactive curriculum activities for students but do not have any instructions regarding the activity, so educators have to spend time figuring out how the site works. In some cases, an excellent activity is not implemented because the user could not determine the correct procedures. This section describes the features of well-designed interactive sites that address the requirements of students, teachers, and parents. These characteristics are not of any single website but are a compilation of several useful interactive pages that provide a template of what educators should expect.

Interactive Web Page Structure

One of the requests often made by teachers who use the Internet is that they want the websites that they or their students use to be "user friendly." When students or educators spend time on the computer, they should not have to experience frustration trying to figure out how to navigate a web page. Interactive web pages
should be so well organized that navigation is almost intuitive. When the user accesses the site, the structure of the page, with its links and interfaces, is so clear that how to navigate the site is discerned easily and detailed directions are not needed. This does not eliminate the need for features that enhance site navigation, such as a site map and an internal search engine; however, their use should be optional and not required for locating data.

Although not required, a well-designed site map provides the user with the topics and information available at the website. A functional site map should provide a one-page outline of the site’s content and its location. The user only has to link to the site map and, within a few minutes, knows what information is available. After reviewing the categories of information, the user then accesses the activities and evaluates their usefulness.

The most efficient site maps have direct links from the site map to the activity. For example, a teacher accesses a site map that shows a list of topics about American history, and one of the topics is the U.S. bicentennial. If the site map list has direct links, the teacher just clicks the bicentennial link to access the wanted information. Maps that do not have links require the teacher to navigate from page to page according to the map’s instruction until the needed content is found. A navigational shortcut would be to use the site’s internal search engine, if one is available.

Lists of the site’s interactive activities by categories also are beneficial to educators. The previously mentioned site, Interactive Skill-Based Curriculum Activities and
Games for Students, has a list based on subjects. If educators are teaching language arts, they access the language arts activity list and browse the names and a one-sentence description of the activity. Time is not wasted viewing the activities from other subjects. Another beneficial category is grade level. For example, fifth-grade teachers should not have to spend their time filtering out activities that are not at their students' developmental level. A combined subject and grade-level list allows teachers to locate activities efficiently.

Another useful method for listing interactive activities is by national standards. Several national organizations have developed standards or guidelines for their discipline. Because of the work of these and other organizations, there are published standards in language arts, mathematics, fine arts, physical education and health, science, technology, and social studies (www.education-world.com/standards/national/index.shtml). One of the challenges teachers encounter is connecting their curriculum and lesson plans with published standards. When an interactive website lists activities based on these standards, teachers easily can access all potential activities linked to the standards.

**Teacher Area**

When publishers send textbooks to educators, they usually include a variety of supplementary materials to help teachers incorporate the textbook into the curriculum. These might include an annotated edition of the text, answers to all exercises, project ideas, lesson plans,
and a technology guide. Similarly, programmers who develop Internet pages specifically for educators often provide links to resource material that will aid teachers. The aids are in digital form and often are located in a specifically labeled section that may be accessed by clicking an icon found on the site's home page. These icons have such labels as "Teacher Corner" or "Teacher Resources," and the section often provides teachers with helpful support.

One section of the teacher area should include detailed instructions about how to use the activity in the classroom. This is not just a set of simple directions, but a detailed explanation of the activity's pedagogical objectives. A well-designed lesson will include an abstract, objectives, standards, student prerequisites, teacher preparation, a lesson outline, and other exercises that will enhance the lesson.

Some sites have a section labeled "Ideas for Teachers" or a similarly titled icon that provides suggestions to help teachers optimally incorporate the Internet activities. These suggestions might be from the professional educators who designed the activity or from teachers who have used the site in their classroom. At the better "Ideas for Teachers" areas, the presented plans range from using an interactive activity in a classroom lesson to term projects that involve several interactive sites. These strategies and methods often are reviewed on the site's discussion board. Teachers can relate how they used the suggested activities in their class and describe the outcomes. Frequently teachers who use the discussion board start personal e-mail conversations regard-
ing the activities. On some sites, teachers can link directly to the developers of the interactive activity in order to ask questions, make suggestions, or clarify concerns. If certain questions or concerns frequently arise, they can be addressed in a "Frequently Asked Questions" (FAQ) area.

Finally, some interactive websites have links that connect the site's activities to published principles and standards or to specific school textbooks. For example, the user may use a pull-down menu to select a textbook or a principle and standard. A list will appear on the screen that links activities that correspond to the chosen standards or textbook. When a textbook is chosen, the activity is correlated with a certain chapter or section so that the teacher does not have to search the whole text to incorporate the activity into the curriculum. This enables the instructor to quickly and effectively evaluate the educational worth of the procedure and determine whether to use the interactive courseware.

**Parent Area**

Most educators understand that the support of parents or guardians is essential to student success, and this frequently is reflected in websites that have a pedagogical base. For example, numerous sites with interactive activities have a section devoted to resources that help family members work with the student. Included are recommendations on how family members can interact with their child's teacher to reinforce what is being taught. Also included are suggestions on how family
members can work with each other so the student obtains the most benefit.

On websites that specialize in presenting students with interactive activities, the parent area has a section that carefully explains the goals of the site. For example, there will be a description concerning the structure of the interactive materials and how they are to be used. When an activity provides an opportunity for family members to be involved, this section will offer suggestions. The recommendation might be simply discussing the result or outcome of the activity with the family member. Another section of the parent area might address technical concerns, such as what software is required, how to download the software, how to print the interactive activities, and what to do if an interactive activity is not working. The best interactive activity will not help any student if the student cannot access the materials. By listing the hardware and software requirements and how to download required software, the parent and student will experience less frustration. When additional software is required to run an activity, the site should provide a link to the Internet site where the software is available.

The parent section also should address each activity and provide facts about the lesson to help parents understand its purpose. With each lesson, there should be stated a reason for the lesson, the goal of the lesson, and the curriculum context. For example, an interactive web lesson designed to learn the names of the countries formed from the former Soviet Union could present the historical context of the breakup of the USSR and why
it is important to know the location and names of the newly formed nations.

**Student Resources**

In addition to the tools for teachers and parents, appropriately planned interactive websites provide a "Student Resources" area to help students maximize the use of the selected activity. Students, like teachers and parents, must understand how to use each assigned lesson and its purpose. What the student should know before beginning the Internet activity should be presented along with any other materials required for the lesson. The information often is identical to that accessed from the teacher or parent page. In addition, the student can access information from the teacher or parent areas. As most educators acutely realize, there are few secrets on the Internet.

The Internet activity should provide the student with as many ways to learn as possible. For example, an Internet activity in which the student names the bones of a human skeleton might include a dictionary that defines the function and location of the bones. A student that is not certain which forearm bone is the radius and which is the ulna can consult the site's dictionary. With this information, the student can label each forearm bone and remember the correct labeling for future assignments.

Other methods of teaching students on interactive websites include presenting hints, demonstrating similar problems, or solving the presented problem. Continuing with the skeleton example, suppose a student did not
know the location of the phalanx. The student could click a hint link, and there would be a statement that a person could stub their phalanx or accidentally hurt their phalanx with a car door. With this hint, the student might remember that a phalanx is any bone of the finger or toe. A demonstration would be for the computer to label the bones of the finger and then ask the student to label the other bones of the body that are also the phalanx. Perhaps the student will make the connection that the bones of the fingers and toes have the same name. Finally, the interactive lesson could reveal to the student the correct labels and have the student later identify them from memory.

A final example from the student resource section are links to sites that students can explore for more information. No web activity provides students with all knowledge. Having links to related sites enables students to access information that will help answer questions about the topic that are not addressed by the interactive web activity. An example would be social studies websites where students learn about foreign folk cultures. During one activity, a student learns how Zhuanghe women of China throw the man they love a ball made of tightly wound colorful silk. The ball represents that the heart of the woman is tightly linked to the heart of the man. The student is quite fascinated by this and would like to learn more about the cultural heritage of Zhuanghe. If links are provided, the student can discover more about the people and customs of Zhuanghe, the Liaodong Peninsula, the Liagning Province, and Manchuria with just a click of the mouse.
Web-Based Activities in the Classroom

The final evaluation for any curriculum activity is based on its effectiveness in the classroom and how well it improves student learning. This is true regardless of format. When textbooks are evaluated, the overriding variable should be how well students will learn with the text. The same should be true for worksheets, homework, the use of technology, or any other lesson activity. The examples of interactive web pages in this chapter describe activities teachers found to increase student learning. Each description is from a different subject area and illustrates how the Internet activity was an integral part of the lesson plan. Using technology was not just an add-on for technology’s sake; the interactive site was a required aspect that students needed to fully grasp the material.

Language Arts

One of the more engaging and entertaining interactive games for the language arts is SleepingGiant Word Well (www.bonus.com/lycos/card/sleepinggiant_wordwell.html). World Well consists of a word square
the size of a checkerboard where each square has a letter. The object of the game is to find as many words as possible by connecting the adjacent letters, moving horizontally, vertically, or diagonally before the allotted time expires. To begin a word, the user clicks on the first letter and drags the cursor from letter to letter until the word is spelled. All words must be between three and eight letters long. As the mouse is dragged from letter to letter, the spelling appears below the word square. Points are added to the student’s score when a word is spelled correctly. What adds to the excitement of the game is that the word square is not static. When letters are used to spell a word, those letters are removed from the board and the columns containing the used letters adjust downward, with new letters added to form a different word square. The game can be played in three different formats and three levels of difficulty, and there is a tutorial for learning how to play.

This game is one of many games found on Bonus.com (www.bonus.com), an interactive entertainment and educational website. Bonus.com advertises itself as a free one-stop center for family entertainment that offers hundreds of interactive games, many learning activities for the classroom, and homework help. The site is completely free. However, there is a voluntary registration process that enables users to enter contests, enjoy player game rankings, and receive updates on new activities. According to Bonus.com, the site is a protected environment that adheres to guidelines set forth in the Children’s Protection Act and the Children’s Advertising Review Unit.
Regardless of how entertaining or engaging the activity, educators must decide if learning is enhanced. For example, teachers in an unpublished local study who used World Well just as it is presented on Bonus.com noticed an improvement in spelling and vocabulary. The students were asked to play the game individually and against each other during school and as a homework assignment. Teachers noticed that papers had fewer misspelled words and that students were using a greater variety of words. When students were asked about their improved vocabulary, they stated that knowing words and how to spell them were required to win Word Well, and they enjoyed the game and wanted to win. This especially was true when the students competed against each other, and they seemed to learn words used by others students during the game.

To capitalize on the competitive aspect of the game and to encourage student cooperation, teachers had each competing student list some of the more impressive words that were spelled. These words then became part of a class vocabulary list. Each student was required to be familiar with the definition and spelling of the words each team brought to the class. The teacher then used these words for building sentences, identifying parts of speech, creating anagrams, or making word rhymes. In this way, Word Well was an integral part of the curriculum and not just a separate game for amusement.

Another interactive web activity for language arts is Power Proofreading, located at the Education Place (www.eduplace.com/edugames.html). In this activity, the local television station has a power failure due to an
electrical storm and needs help from the students as proofreading technicians. The user selects a grade level and the story, script, or memo to correct. Each selection focuses on one segment of proofreading, such as correcting pronouns or punctuation. After the selection is chosen, the user clicks the error and corrects it. Correct editing scores points, and incorrect choices are indicated by a distinct sound. The student can obtain help by clicking an icon that displays grammar rules specific to various areas of proofreading. Education Place also has the activity “Fake Out,” in which students guess the definition of words. They also can submit a creative, but incorrect, definition that might be used by the activity developers to stump other players.

Social Studies

GeoNet is an interactive game at the Education Place that can be used in social studies for students grade four and above. Based on the six essential elements of the National Geography Standards, the activity enables the student to earn the ranking of GeoAdvisor, GeoExpert, or GeoChampion by answering geography questions about the United States. Many teachers commend this activity for being noncompetitive. The “Geo” rankings are earned by answering the questions correctly and acquiring enough points to attain each level. All students can “win” the game, and the site enables each student to print a certificate of accomplishment after earning each rank.

Students can choose to answer questions about the United States as a whole, or they can limit the questions
to one of four areas of the country. There are six categories of questions, and students can choose easy or difficult questions. The difficult questions are worth more points than the easy questions. The questions are multiple choice, and the students have three tries to answer the question, though the points earned decrease with each attempt. If the student is completely lost, each question has an “I give up” icon that explains the correct answer.

The website has well-written instructions about how to play and a list of the geography standards addressed by the game. When using the game as a classroom activity, teachers have developed two major strategies. The first is based on the area of the United States being studied. If the class is studying the Northeast, the teacher has the students click that area of the country when starting the game. All questions then correspond to the lesson and reinforce the required knowledge.

Another approach is to base the game on one of the six National Geography Standards. The teacher requests the students to click the United States icon, instead of a region. After clicking the United States icon, six icons that correspond to one of the six geography standards appear on the screen. The student then clicks the icon indicated by the teacher. Most teachers award credit for this activity based on the printed certificate.

Science

The interactive Internet activity for science is different from the previous examples because it is not a game but a presentation. A Virtual Journey into the Universe
(library.thinkquest.org/28327) is a virtual reality program that has the student in the cockpit of a spacecraft overlooking the solar system. The student selects a planet to explore, then picks from a menu to obtain the desired knowledge. For example, if the student chose Neptune, a menu would appear with icons that are labeled exploration, surface, interior, satellites, interactive, and cockpit. A student who desires information about the moons of Neptune would click the "satellites" icon, and eight icons with the names of Neptune's moons come into view. By clicking one of these icons, data about the selected moon is presented.

This program is part of the ThinkQuest library (www.thinkquest.org/library/index.html) that contains more than 5,000 websites that have been designed by students for students. Each year ThinkQuest has competitions for students to design unique educational web pages, and the winning pages become part of the library archive. The archive is arranged in menu format according to subject and topic. For example, the "Science and Technology" category includes technology, earth science, and physical science. Each is a link that connects the user to the programs that present knowledge about the requested area.

When evaluating A Virtual Journey into the Universe, educators will notice the effective graphics in the program and that the information is well organized and easy to read. The text also highlights key words that are in the program's dictionary. If the user does not know the meaning of a highlighted word, a simple click of the mouse will bring the definition to the screen. Educators
who teach a unit on astronomy find this site helpful as part of a classroom presentation. Using the menus in the program is more versatile than turning pages of a book, and this program has more information and better graphics than found in most texts. After the teacher presents the program in class, students can access the program on their own to reinforce their learning or do further exploration.

Of course, teachers must have the required hardware and software to use this program in their classroom. The classroom requires an Internet connection, preferably with a high-speed data line; and the room must have a computer with a projection system so all the students can see the presentation. The computer requires the software needed to browse the Internet and to take full advantage of all the features of the program. For example, A Virtual Journey into the Universe uses Java and Shockwave. In most cases, the required software may be downloaded from the Internet without cost; and practically all programs provide links to the site where the software is available.

Mathematics

Many interactive websites have simulation programs to help students understand a particular topic. In an elementary statistics course, students may have problems understanding the concept of linear correlation between two variables. Most books picture a scatter plot and explain that the correlation coefficient, \( r \), measures the strength and direction of the relationship between the
two variables. When the $r$-value is close to $+1$, there is a strong positive linear relationship. An $r$-value close to $-1$ indicates a strong negative linear relationship, and a value of $r$ close to zero indicates a weak or no linear relationship. The statistics text might have pictures of several scatter plots that include the line of best fit to illustrate different values of $r$.

Even with the pictures in the text, many students do not understand how the scatter plot is changing as the values of $r$ change. Simulations can enhance student understanding by allowing students to manipulate certain variables and observe any changes. For example, the correlation coefficient simulation at the Internet address, noppa5.pc.helsinki.fi/koe/flash/corr/ch16.html, allows the user to change $r$ and the number of data points on the scatter plot to a number between five and one hundred. The user then observes how the scatter plot changes based on the change in the value of $r$. Instructors with Internet access in the classroom and a computer-based projection system can incorporate simulations in their teaching. Most find that the simulations provide the students with a greater understanding of the topic than do the static pictures in the text.
Conclusion

There is an irony to having a conclusion to this fast-back because the technology of interactive websites is just out of its infancy, and the future indicates abundant growth. The first interactive websites were the drill-and-practice sites from the early 1990s, of which some are still available. Next came interactive websites that linked text, graphics, and sound. As the computers and their accompanying technology became more sophisticated, the educational applications of Internet-based programs continued to increase. Today’s applications make the programs developed only a few years ago seem rudimentary, and tomorrow’s developments will make what is used today appear primitive. Technology continues to improve at an exponential rate, and the expansion is expected to continue into the foreseeable future.

Educators expect computer-based technologies to enhance student learning, but technology can be valuable or detrimental. It is the classroom teacher that determines the educational worth of the technology and what technology should be implemented. The phrase often heard among computer programmers, “garbage in, garbage out,” also applies in teaching; but we can add
another phrase, “proficient in, proficient out.” If computer technologies, including interactive websites, are poorly designed, learning does not take place. However, a well-designed interactive site can expand student learning and help more students succeed.

In 2002, the phrase “no student left behind” became almost an education mantra. How could any educator disagree with the intent of the statement? All teachers want their students to succeed, and most teachers work hard to provide an environment that promotes learning. The problem occurs when catch phrases become political statements that have political agendas. Educators should have the freedom to experiment with all available tools for the benefit of their students. When using the Internet and interactive websites, the goal is to discover what will enrich the curriculum and help students succeed. There is not any one product, program, or model that will solve all the problems of education. But the interactive web page is one of the tools that can help make “no student left behind” a realizable goal and not just a political slogan.
The following is a list and description of the websites referenced in the text. As of the writing date, all addresses were active. Because the Internet is not static, World Wide Web addresses may change. To determine if the information still is available for any outdated address, type the title of the web page into a search engine and check the results.

www.calculator.com — Links to more than a dozen types of calculators
www.nationalgeographic.com/whitehouse/whhome.html — Inside the White House
www.yahoo.com and www.google.com — Internet search engines
www.geminfo.org — Gateway to Educational Materials
www.merlot.org — Multimedia Educational Resource for Learning and Online Teaching
www.shodor.org — Project Interactivate
matti.usu.edu/nlvm/nav/index.html — National Library of Virtual Manipulatives
www.forsyth.k12.ga.us/sbeck/interactive_curriculum_sites.htm — Interactive Skill-Based Curriculum Activities and Games for Students
www.thinkquest.org/library/index.html — ThinkQuest library
library.thinkquest.org/10157 — Geo-Globe
library.thinkquest.org/28327 — A Virtual Journey into the Universe
www.eduref.org — Educator’s Reference Desk
www.bonus.com — interactive entertainment and educational website
www.bonus.com/lycos/card/sleepinggiant_wordwell.html — Word Well
www.eduplace.com/edugames.html — Education Place
noppa5.pc.helsinki.fi/koe/flash/corr/ch16.html — Correlation Coefficient Simulation
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