

A System for Classifying Educational Web Sites

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Educators and individual learners are increasingly turning to the World Wide Web (WWW or Web) for educational materials and activities. It seems that educational institutions at all levels have either launched online initiatives or are planning online learning opportunities. In addition, all kinds of public and private organizations proffer online learning materials. Every Web user is a potential publisher, and individuals and groups across all geographic boundaries and all ideological viewpoints are creating “educational” materials for the Web. In terms of available content and quality control this may be the best of times and the worst of times.

This massive collection of online learning material and activities is largely unfiltered, particularly when compared to the process of print publishing. There are thousands of educational sites on the Web addressing myriad topics, with widely ranging quality and reliability. Educators and learners do not have the time necessary to sift through thousands of sites to find the best resources for their purposes, and they need ways to help them separate the wheat from the chaff.

To aid teachers and learners, some organizations publish lists of what they deem the best educational Web sites. A recent study (Martindale, Cates, & Qian, 2003), evaluated “exemplary” Web sites as determined by four such recognizing organizations: (1) The International Academy of Digital Arts and Sciences, (2) Homeschool.com, (3) *PC Magazine*, and (4) the Eisenhower National Clearinghouse for Mathematics and Science Education (ENC).

The International Academy of Digital Arts and Sciences (2003) bestows its annual “Webby Awards”, including a category for educational sites. Similarly, Homeschool.com (formerly Education Source) lists its top 100 educational Web sites for each year (Homeschool.com, 2003). The editors of *PC Magazine* (2003) publish a list of their top 100 Web sites, including sites in the *Education and Family* category. Lastly, each month the ENC identifies its “Digital Dozen”—thirteen “exemplary” educational Web sites in science

and mathematics. While there are certainly other organizations recognizing “exemplary” sites, these sites from the four organizations above represent something of a microcosm of the kinds of sites likely to receive such endorsements, and are thus likely to come to the attention of educators and learners.

As we examined a large collection of approximately 199 sites recognized as “exemplary,” we gradually derived a system to classify what had been endorsed. We also began to create a common vocabulary for discussing educational Web sites and their various affordances and purposes. While the objective of our study was to categorize and look for trends in those “exemplary” sites, the resulting classification system can be used for any educational site or collection of sites.

For the purposes of creating our classification system, we defined a site as “educational” if the content primarily addressed teaching and learning through either formal or informal education. *Formal education* includes instructional activities under the auspices of a learning institution or in a classroom setting, while *informal education* usually take place outside the formal classroom setting and is not a normal part of a school program, activity, or assignment (National Science Foundation, 2003).

The Classification System

Below we discuss thirteen categories of educational Web sites and the definitions used in helping to formulate them. We acknowledge that the creation of any classification system entails decisions and distinctions that are open to debate. That said, the three researchers in our original study (Martindale, Cates, & Qian, 2003) debated all decisions at length and arrived at the distinctions that proved most useful in creating discrete categories.

1. *Instructional*

In our system, to be classified as Instructional, a site must include three key elements: (1) intended learning goals, (2) instructional strategies, and (3) learning materials and activities. All three instructional elements may be explicitly stated/demonstrated

or they may be embedded within the site's content. Instructional sites may also include learner assessment and/or feedback, but these are not required as the first three elements are. An instructional site must do more than simply provide information; it must also incorporate instructional strategies. *Instructional strategies* are specifications for selecting and sequencing events and activities in a learning environment (see Seels & Richey, 1994 and Smith & Ragan, 1999).

Some Instructional Web sites are quite open-ended, employing exploratory and highly individual approaches. These sites may not, therefore, include explicitly stated learning tasks or objectives. In order to qualify as Instructional, however, such sites would need to incorporate learning activities that enable learners to achieve learning outcomes.

First examination of a site may mislead someone seeking to categorize it. For example, a site that is not principally instructional may still contain instructional elements: A site containing quizzes and games for learning may actually be primarily designed for entertainment, not for achieving instructional goals. The labels and descriptions within or about Web sites can mislead as well: A site that labels itself as a *tutorial* or a problem-based learning project may, in fact, meet only one or two (or none) of the three essential instructional elements (instructional strategies, intended learning goals, and learning materials and activities).

Examples of Instructional sites are (1) *Learn Physics Today* (<http://library.thinkquest.org/10796/>), which teaches secondary-level physics; and, (2) *Conflict Yellowstone Wolves*, a site that challenges learners to consider the pros and cons of reintroducing wolves to Yellowstone National Park. (<http://www.powayschools.com/projects/mt&r/ConflictYellowstoneWolf.htm>).

2. Learning Activities

Learning Activities sites offer a range of online learning activities and/or games. While these activities may be incorporated into the classroom, lab, or distance-learning curriculum, such sites do not exhibit the three essential elements of Instructional sites (instructional strategies, intended learning goals, and learning materials).

Examples of Learning Activities sites are (1) Explore Math (<http://www.exploremath.com/index.cfm>), a collection of algebra and calculus tools and tutorials; and (2) Visual Fractions (<http://www.visualfractions.com/>), a set of tools for learning about fractions.

3. Content Collection

Content Collection sites provide compilations of information about a specific content area (such as the Civil War or haiku poetry). While informative, such sites do not qualify as Instructional because they do not provide the three essential elements. Content Collection sites typically offer informative readings, illustrations and rich content. A site may offer external links, but to be classified as a Content Collection in our classification system, the majority of the content should be contained within the site. A site that directs the user to primarily external content through links is classified as Lists of Links (see below).

Examples of Content Collections are (1) Chemicool Periodic Table (<http://www-tech.mit.edu/Chemicool/cgi-bin/periodic-table.pl>), a site with information on chemical elements; and (2) The Children's Music Web (<http://www.childrensmusic.org/>), a site with resources on children's music.

4. List of Links

A site in this category features organized external links to resources about a topic or theme. The site should principally be an index to external content; it should contain little or no original content. Sites whose links are mainly to internal content on their own Web pages are classified as Content Collections.

Examples of Lists of Links are: (1) Index of Native American Resources on the Internet (<http://www.hanksville.org/NAresources/>) and (2) The Civil War Page (<http://sunsite.utk.edu/civil-war/warweb.html>), a collection of external resources about the United States Civil War.

5. *Reference/Archive/News/Database* Reference/Archive/News/Database (RAND) sites offer access to (1) reference tools (encyclopedia, dictionaries, atlases, and the like), (2) archives of resources of potential educational value, (3) news, and (4) potentially useful databases for teachers or learners. Such sites are designed as information and reference tools and are usually indexed chronologically, alphabetically, or topically. This category also

covers online news agencies, reference books, and question-answer services. RAND sites differ from Content Collections because they often address multiple topics and are oriented toward searching for information, as opposed to examining already-collected information on a single specific topic.

Examples of RAND sites are: (1) American Memory (<http://memory.loc.gov/>), a searchable database of historical records from the Library of Congress; and (2) Internet Public Library (<http://www.ipl.org/>), a comprehensive reference and search site.

6. *Teacher Resource*

Teacher Resource sites provide teachers with lesson plans, classroom activities, teacher guides, curricula, state and national standards, and professional-development resources, either in the form of materials to be examined online or downloaded for subsequent examination. The main focus of such sites is assisting teachers, although the sites may also include subject matter links and learner activities. Teacher Resource sites frequently address visitors using language appropriate to teachers (for example, *your students*, *your classroom*, *your school*). Examples of Teacher Resource sites are: (1) Geometry Through Art (<http://mathforum.org/~sarah/shapiro/index.html>), a resource for teachers of geometry; and (2) Project LABS, a site with resources to support teachers of basic science.

7. *Vicarious Participation*

A Vicarious Participation site allows learners to take part online in an ongoing educational or research activity or expedition, including virtual field trips. These sites seek to give learners a sense of being part of activities not usually available in the traditional classroom. Vicarious Participation sites may also archive materials from past explorations for subsequent educational use. Examples of Vicarious Participation sites are: (1) Postcards from America (<http://www.postcardsfrom.com/>), a site about travelers in a recreational vehicle who post educational material about their travels; and (2) EstuaryLive (<http://www.estuarylive.org/>), a site with ongoing experiments involving estuaries.

8. *Personal Expression and Interpersonal Interaction*

Sites categorized as Personal Expression and Interpersonal Interaction (PEII) facilitate discussion, interaction, and information

sharing. Users of sites in this category might play interactive games and share thoughts and ideas with each other using e-mail, chat, and/or message boards. PEII sites usually do not offer structured learning activities, although they may encourage discussion of current events and issues important to learners, thus contributing to education in a broader sense. Examples of PEII sites are: (1) CyberKids (<http://www.cyberkids.com/>), a site where children can post artwork and have discussions; and (2) Kids Space (<http://www.kids-space.org/>), also a site for uploading artwork and other creations, and for topical discussions.

9. *Informal Education*

Informal Education sites feature actual places (such as zoos, museums, historic sites, gardens, aquaria, and parks) that have an informal education component. These sites usually provide non-educational information, such as visitor information, schedules, exhibit information, maps and directions, membership and funding information, and details of special events. Usually these sites also contain education sections with learning materials and activities for teachers and students. Informal Education sites differ from Instructional sites in that they do not include all three essential elements: instructional strategies, intended learning goals, and learning materials and activities.

Examples of Informal Education sites are: (1) Colonial Williamsburg (<http://www.history.org/>), a site about 18th century Williamsburg, Virginia; and (2) Edison National Historic Site (<http://www.nps.gov/edis/home.htm>), a site about the work of Thomas Edison.

10. *Virtual Exhibit*

A Virtual Exhibit site is a focused collection of media (images, audio, animation, and/or video) related to some particular real-world exhibit or event. Virtual Exhibit sites represent online versions of actual exhibits from museums and other organizations in the physical world, although these exhibits may not be currently available to the public. That is, a virtual exhibit may show a collection not presently on display because of its size, as might be the case for an industrial history collection involving large machinery. Or a Virtual Exhibit might be an online archive for exhibits no longer available for viewing, as might be true for traveling displays or temporary collections of

holdings from multiple museums. Virtual Exhibit sites differ from Informal Education sites because they are more limited in scope. That is, a Virtual Exhibit represents one special exhibit, not an entire institution.

Examples of Virtual Exhibit sites are: (1) Helaman Ferguson Sculpture (<http://www.helasculpt.com/>), a collection of this artist's mathematical artwork; and (2) The Geometry of War (<http://www.mhs.ox.ac.uk/geometry/title.htm>), a special exhibit of the Oxford Museum of the History of Science.

11. *Research or Not-for-Profit Organization (RNO)*

RNO sites represent specific research, academic, or non-profit organizations. Such sites typically address the nature and purpose of the organization, its current and past projects, recent results, news and events, and any related educational materials and activities. Examples of RNO sites are: (1) Chandra X-ray Observatory Center (<http://chandra.harvard.edu/>), a NASA-related astronomy site; and (2) United States Geology Survey (<http://www.usgs.gov/>), a bureau of the U.S. Department of the Interior.

12. *Curriculum or Research Project*

Curriculum or Research Project (CRP) sites are intended to inform visitors of particular ongoing educational research or curriculum projects. These sites often includes news and upcoming events, research results and publications, individuals associated with the projects, funding, and other related information. While these sites may also offer supplementary materials for teachers and learners, they seek principally to promote the sponsoring project. Projects represented in CRP sites may or may not be affiliated with a particular organization. Thus, CRP sites differ from RNO sites because they represent temporary projects, not organizations. An example of a CRP site is Voices of Girls in Science, Mathematics, and Technology (<http://www.ael.org/nsf/voices/index.htm>), a three year project to help girls feel confident in these subject areas.

13. *Commercial*

The primary goal of a Commercial site is to promote and sell products and services. These sites may include additional components designed to inform, educate, or entertain. For example, a company Web site selling breakfast

foods might include information or instruction about the nutritional value of their products.

The presence of sponsorship or advertising does not necessarily mean a site should be categorized as Commercial, since advertising is now widely used by educational sites in all categories to cover expenses such as technical support and site hosting. To be classified as Commercial, a site's primary goal must be to promote or sell products or services.

Examples of Commercial sites are: (1) Disney (<http://disney.go.com/park/homepage/today/flas h/index.html>), a site primarily designed to promote theme park vacations and merchandise; and (2) U.S Space Camp (<http://206.166.221.131/spacecamp/welcome.jsp>), a site designed to promote the camp.

Using the System

Given the divergent nature of many educational sites on the Web, it was almost impossible to derive a system composed of completely discrete categories. When one applies this system to Web sites, it helps to focus on the intent of the site as a whole and to use that comprehensive view as the principal guide to classification. An alternate approach is to classify sites by the proportion of their content that falls into several site categories (for instance, 40% Instructional / 40% Content Collection / 20% Teacher Resource). Both approaches will have their proponents and both are valid.

A larger question might be, "Why should educators and learners have a classification system for educational Web sites?" We contend that having a classification system facilitates discussion of educational Web sites and provides a common vocabulary for subsequent analyses of such sites. Further, we propose that use of the system to classify groupings of promising sites according to what they offer might help to impose some measure of order on the chaos of the Web. That is, if educational portals were organized to direct users to sites on the basis of this classification system, it would enable users to find what they need more efficiently.

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