EVALUATING ELECTRONIC INFORMATION RESOURCES FOR YOUNG WOMEN: GENERAL RESEARCH CONCEPTS

Leading Young Women to the Sciences and Technology is a joint undertaking of Douglass College's Douglass Project for Rutgers Women in Math, Science, and Engineering and of the Girl Scouts the USA. Funded by Toyota USA Foundation, the project seeks to develop institutes, materials, and other methods for encouraging adolescent women to enter science and technology fields.

Part II of this project focuses on science and technology electronic information resources. Based on analysis of related research literatures, original research, and analysis of pilot study results, the project investigator has created a framework for evaluating the quality of science and technology CD-ROMs and websites for young women. The Electronic Information Evaluation Framework combines findings from research related to gender and technology use, findings from research related to young people's information seeking behaviors, findings from research related to instructional systems design, and original theoretical work. **In brief, the Electronic Information Evaluation Framework includes eight evaluation criteria related to gender: confidence, collaboration, personal identification, contextuality, flexibility/motility, social connectivity, inclusion, and graphic/multimedia concentration.** Resources that are strong in many or all of these areas are more likely to appeal to young women than are resources weak in many or all of these areas. The framework also includes gender-independent evaluation criteria, which fall into three main groups: information evaluation criteria, design evaluation criteria, and workability evaluation criteria. Detailed explanations of the both the gender-specific and the gender-independent evaluation criteria are discussed, as is a visual model of the Electronic Information Evaluation Framework.

After creating the gender-related Electronic Information Evaluation Framework, the project investigator applied it to over 400 CD-ROMs and websites to produce lists of materials recommended for encouraging young women to explore science and technology fields. These lists are also enclosed.

Underlying this research are three major concepts. These concepts are explained below.

1. **Long-Lasting Influence**

Electronic information resources are ephemeral. Many CD-ROMs quickly go out of production, and websites regularly move, change, and disappear. Thus, in addition to producing lists of recommended resources, creating an evaluation framework that is grounded heavily in young women's information seeking behavior research will serve to extend the influence of Part II of Leading Young Women to the Sciences and Technology long beyond the obsolescence of the resources on the recommended lists. Teachers, librarians, parents, and other adult intermediaries will be able to apply this evaluation framework to new electronic information resources for many years to come.

2. User-Centered Research

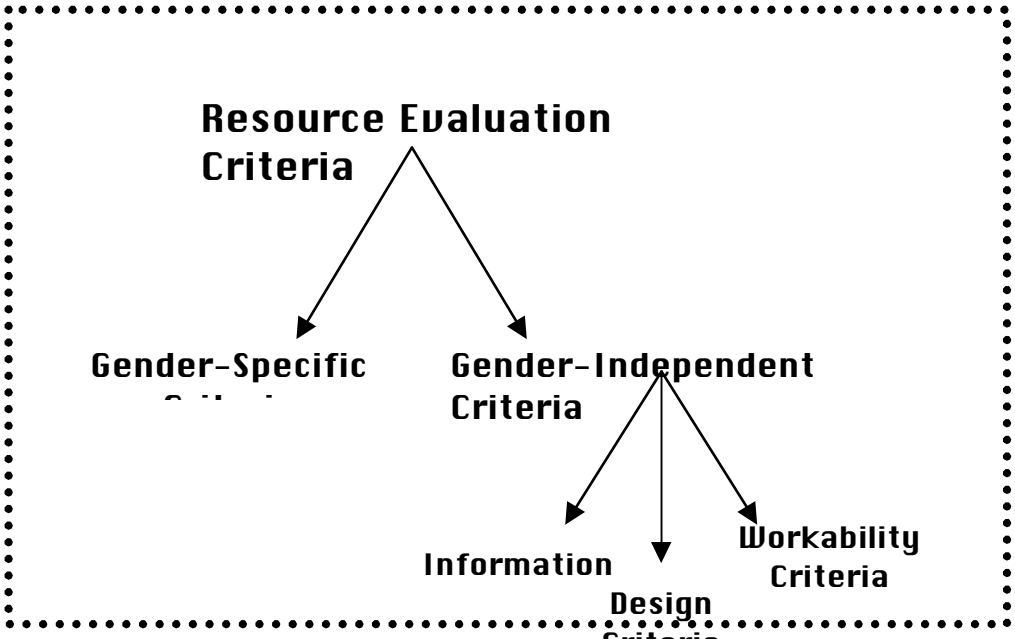
The only way to know what aspects of electronic information resources appeal to young women is to ask them. Many organizations have created and continue to create lists of recommended electronic information resources for youth, but exceedingly few of these organizations base their selections on input from actual young people. By incorporating data from questionnaires and group interviews into the recommended resources lists and evaluation criteria framework, this research is user-centered, hinging on the idea that young women know best what types of resources will encourage other young women to enter science and technology fields.

3. High Quality/High Interest Resources

If the Project Investigator were merely to select the resources she deemed to be the highest quality available, the resulting recommended materials lists might include resources of little general interest to young women. In such a case, it seems likely that only young women who already express an interest in science and technology would be motivated to use these resources. Hence, the Project Investigator has selected resources that are both high quality **and** high interest, hoping that some young women who do not profess science and technology interest might find the recommended resources to be so enticing that they will explore them anyway. Once absorbed in one of these high quality, high interest CD-ROMs or websites, young women without previously recognized interests might come to see that that they are indeed interested in these topics.

EVALUATING ELECTRONIC INFORMATION RESOURCES FOR YOUNG WOMEN: VISUAL MODEL

The following visual model depicts the relationships among the various groups of criteria that compose the entire Electronic Information Evaluation Framework.:



EVALUATING ELECTRONIC INFORMATION RESOURCES FOR YOUNG WOMEN: GENDER-SPECIFIC EVALUATION CRITERIA

The following gender-specific evaluation criteria and corresponding evaluation questions are designed to assist teachers, librarians, parents, and other adults in selecting high quality, high interest electronic information resources for young women. Although the Electronic Resource Evaluation Framework, of which the gender-specific criteria form a major part, was designed specifically to target resources of high interest and high appeal to young women, it is important to understand that its use will identify resources likely to appeal to *most*, not *all*, young women, because not all young women exhibit gender-specific electronic information preferences. Gender schema theory explains that sex is biologically determined and dichotomous, whereas gender is socially constructed and continuous. That is, genetic makeup determines whether a person is a woman or a man, but societal conditions result in a person's viewing the world in gender-schematic or gender-aschematic terms. As Bem explained,

> Gender schema theory proposes that sex-typing derives in large measure from gender-schematic processing, from a generalized readiness on the part of the child to encode and to organize information--including information about the self--according to the culture's definitions of maleness and femaleness. (1987, p. 231)

Gender-schematic, or sex-typed, individuals are those who view the world largely from a gendered point of view, bifurcating society into female and male components. Gender-aschematic, or non-sex-typed, individuals do not view the world in this generally bifurcated manner. Thus, a young women who is strongly gender-schematic is likely to identify herself as a stereotypical young woman according to society's general stereotype of the ideal female (i.e. nurturing, acquiescent, non-confrontational, untalented in working with electronics and technology, etc.) and to consequently have an attitudinal barrier against pursing a science, math, or engineering career. Those disciplines, she would think, are appropriate for young men, not for me. There is nothing biological that prevents her from becoming a scientist, a mathematician, or an engineer; the societally-nurtured attitude that she has adopted prevents her from doing so. Consequently, resources selected according to the following evaluation criteria can be used to attract gender-schematic young women to the science and technology fields, thereby serving to counteract an attitudinal barrier that prevents many young women from pursuing these disciplines.

Although the concepts of "sex" and "gender" should not be conflated, and it must be understood that electronic information preferences vary among young women, the goal of this research is to discover what aspects of electronic information resources are most likely to attract and to repel the greatest numbers of young women. As Cassell and Jenkins (1998) explained, to assert that all young women share the same preferences and wants is artificial, but necessary: "Despite the clear dangers of such 'sweeping generalizations,' the ability to determine what girls want may seem necessary at a time when we are trying to open up a space for girls to participate within this medium at all" (p. 25). For this reason (and for greater parsimony), the terms "women" and "young women" are used in place of the more exact terms "gender-schematic women" and "gender-schematic young women" throughout the following presentation and explanation of the gender-specific criteria.

ELECTRONIC INFORMATION EVALUATION FRAMEWORK: GENDER-SPECIFIC CRITERIA

G -- **Gender-Specific Evaluation Criteria**

G1. Confidence

G2. Collaboration

G3. Personal Identification

G4. Contextuality

G5. Flexibility/Motility

G6. Social Connectivity

G7. Inclusion

G8. Graphic/Multimedia Concentration

Explanations of each of these evaluation criteria follow, with a list of related questions to consider when evaluating CD-ROMs and websites for young people.

G -- GENDER-SPECIFIC EVALUATION CRITERIA

G1. CONFIDENCE

One of the main reasons that gender-schematic young women rarely consider science, math, and technology careers is that they lack self-confidence in these areas, whether or not they lack related ability. From her interviews with highly educated, intelligent women who are nonetheless reluctant to use computers, Turkle (1988) has concluded that "The central issue for these competent and talented women is not phobia or lack of ability, but a reticence to become more deeply involved with an object experienced as threatening" (p. 366). Similarly, Opie (1998) traced girls' reduced levels of confidence with computers to their lesser developed technological skills. Comber et. al (1997) traced these reduced levels of computer confidence to adolescent women's less frequent use of computer games, the majority of which are designed for and marketed to males (1997). Resources that offer strong encouragement and support can help to counteract this gender-related self-doubt.

Related questions to consider during resource evaluation:

- Does the resource use a tone of respect in regard to users' abilities, or does it seem to present itself as exclusively authoritative?
- Does the resource encourage users to explore related topics on their own?

- Above all, does the resource support and nurture young women's confidence in themselves and in their abilities?

G.2. COLLABORATION

In general, women tend to prefer learning through collaboration; men generally prefer learning through competition (Brunner, Bennett, & Honey, 1998; Burdick, 1996; Martin, 1998; Mayberry, 1999; Miller, Chaika, & Groppe, 1996; Seymour & Hewitt, 1997).

As Seymour and Hewitt found in their interviews with undergraduate science majors, many young women find competition-based learning repellent: "As [the students'] comments indicate, most women prefer not to see learning turned into a competitive activity--indeed, they tend to view competition as getting in the way, both of good learning and of good collegial relationships" (1997, p. 264). As a result, when selecting electronic information resources for young women, resources not based on competition are preferable to those that present information through competitive formats, such as scored quiz games.

Related questions to consider during resource evaluation:

- Does the CD-ROM or website include a game component? If so, how competitive is it?
- Does the resource encourage exploration and inductive learning, or does it imply that the user should already be proficient in the subject matter?

G3. PERSONAL IDENTIFICATION

A considerable amount of research indicates that young women learn more when they can relate lessons and problems to their personal lives (Miller, Chaika, & Groppe, 1996; Roychoudhury, Tippins, & Nichols, 1995; Subrahmanyam & Greenfield, 1998). A derivative concept is that many young women learn best through role-playing, which allows them to use their imaginations to experience personally an unfamiliar lifestyle.

Related questions to consider during resource evaluation:

- Is it likely that most young women will find a connection between their personal lives and the context of the CD-ROM or website?
- Does the resource encourage role-playing?
- Is the general topic matter likely to be of interest to young women?

G4. CONTEXTUALITY

Young women tend to perform better in science and technology coursework when lessons and problems are introduced in context (Honey, et al., 1991; Lage & Treglia, 1998; Scaife, 1998). That is, young women are likely to understand better the process through which a refrigerator chills foods from a narrative describing a restaurant refrigerator and its role in preserving foods for customers than from a diagram that depicts the inner workings of that same refrigerator. Moreover, women of all ages tend to prefer information presented within a narrative, a format that supports contemplation and interpretation. Men of all ages tend to prefer information presented in a more rigidly structured framework, or a format ideal for ready analysis.

Related questions to consider during resource evaluation:

- Are information contexts (histories, stories, explanations, backgrounds, etc.) emphasized?
- Is information presented in story format, or as isolated facts, figures, charts, and graphs?
- Does the resource encourage contemplation and interpretation or immediate analysis?

G5. FLEXIBILITY/MOTILITY

Some women dislike computers based on a belief that there is just one "right way" of doing things in the digital world (Brunner, Bennett, & Honey, 1998; Miller, Chaika, & Groppe, 1996; Roychoudhury, Tippins, & Nichols, 1995; Turkle, 1988). This gender-based attitude surfaces in women's and men's evaluation of computer software. In general, women "are drawn towards a style of programming...best characterized as...a relational encounter.... It is marked by an artistic, almost tactile style of identification with computational objects, a desire to 'play with them' as though they were physical objects in a collage" (Turkle, 1988, p. 50). Many men, on the other hand, tend to prefer a risk-taking style, "characterized by testing the limits of both machine and self through mastery and manipulation of the computer environment" (Turkle, 1988, p. 47).

Miller, Chaika, and Groppe (1996) found that the young women they interviewed did not desire closure of a section of a computer game "before moving onto another game or segment of a game. They seemed to prefer moving freely among environments without 'completing' or winning one. The contrasting paradigm -- that players will continue until they win or move to the next level -- which usually appears in popular gaming software, was not observed at any of the sessions" (p. 31).

Consequently, young women are likely to prefer electronic resources that have multiple possible paths and many correct answers to questions and problems posed.

Related questions to consider during resource evaluation:

- Do questions and problems embedded within the resource have just one correct answer?
- Does the CD-ROM or website allow the user to select from numerous navigational paths?
- Does the resource allow the user to rearrange the physical placement of objects on the screen?
- Does use of the resource involve cognitive risk-taking and penalties for selecting incorrect choices or paths, or are multiple use styles encouraged and rewarded?
- Does the resource require closure, or does it support fluidity and exploration?

G6. SOCIAL CONNECTIVITY

Women tend to value computers for their ability to connect them with other human beings and as tools that facilitate communication with other humans (Brunner, Bennett, & Honey, 1998; Honey, et al., 1991; Schofield, 1995; Subrahmanyam, & Greenfield, 1998; Turkle, 1988). Conversely, men tend to view computers as tools, valuable and impressive as examples of technological power. Most importantly, women are more apt to respond positively to information

presented in terms of human relationships than to information presented for information's sake alone.

Related questions to consider during resource evaluation:

- Does the resource emphasize the importance of its topic matter to human relationships?
- Is there a method for contacting other people, such as a chat room for speaking to experts, or an email address for obtaining further information?
- Does the resource lend itself easily to small-group use?

G7. INCLUSION

The illustrations and photographs in most science and technology texts show many more male scientists than female scientists (Schofield, 1995; Walford, 1981). Similarly, the contributions of female scientists have largely been excluded from written histories (Harding, 1991). To express the idea that all young women, and all young people, can become scientists, resources should depict roughly equal numbers of women and men, as well as people from many racial and ethnic groups, in positions of status and leadership in science and technology.

Related questions to consider during resource evaluation:

- Are women and men represented in roughly equal numbers in narrative, graphic, audio, and video content?
- Are people of diverse racial and ethnic backgrounds depicted?
- When women and members of marginalized groups are represented, are they presented in positions of respect and influence, or are they shown performing auxiliary roles?

G8. GRAPHIC/MULTIMEDIA CONCENTRATION

Research shows that young people prefer electronic information resources with considerable amounts of high quality graphic and multimedia content to plain-text resources (Fidel et al., 1999; Kafai & Bates, 1997; Wolcott, 1998). For most young women, quality and amount of multimedia content are exceptionally important in maintaining their attention and interest (Miller, Chaika, & Groppe, 1996).

Related questions to consider during resource evaluation:

- Is there a relatively high percentage of graphic and multimedia content?
- Are the graphics clear and easy to understand?
- Are the audio and video components high quality?

EVALUATING ELECTRONIC INFORMATION RESOURCES FOR YOUNG WOMEN: GENDER-INDEPENDENT EVALUATION CRITERIA

In addition to the gender-specific evaluation criteria, the literature reveals other criteria that all young people, both female and male, use to evaluate electronic information resources. Unlike the gender-specific criteria, the gender-independent criteria include evaluation standards that are important to young people as well as standards that are important to adult information specialists (i.e. professors, librarians, and school media specialists). Adult specialists use these criteria to guarantee that the resources they select for young people are of high educational and informational value. For instance, although few young people evaluate the authority of a CD-ROM or website, adult information specialists seek resources with strong authority to ensure that the information they contain is authoritative. For examples of evaluation criteria lists that information professionals suggest, see Evaluating the Quality of Web-Based Information (Agosto, 1999).

The following evaluation framework includes three major categories: information evaluation criteria, design evaluation criteria, and workability evaluation criteria.

ELECTRONIC INFORMATION EVALUATION FRAMEWORK: GENDER-INDEPENDENT CRITERIA

I -- **Information Evaluation Criteria**

I1. Quality of informational content

I2. Level of difficulty of informational content

I3. Authority of authoring/sponsoring body

I4. Currency of information

I5. Purpose of resource

D -- **Design Evaluation Criteria**

D1. Quality of graphic and multimedia content

D2. Quality of general design

D3. Inclusion of links

D4. Amount of graphic and multimedia content

D5. Level of interactivity

D6. Complexity of organizational system

W -- **Workability Evaluation Criteria**

W1. Loading speed

W2. Workability of links

W3. General workability

Explanations of each of these evaluation criteria follow, with a list of related questions to consider when evaluating CD-ROMs and websites for young people.

I -- INFORMATION EVALUATION CRITERIA

I1. QUALITY OF INFORMATIONAL CONTENT

For most information professionals, the quality of informational content is the most important evaluation criteria for any information resource. In fact, all 14 of the information resource evaluation tools linked to Evaluating the Quality of Web-Based Information (Agosto, 1999) include suggestions for assessing information quality.

On the other hand, many young people do not evaluate the quality of the information they find in printed and electronic materials, assuming that it is accurate. Kafai and Bates (1997) learned in their work with elementary school Web users that "As with books, the children were quick to assume everything they found about their topic on the Internet was correct just because it was there" (p. 109). However, much of the information contained in electronic resources, especially in personal websites and webpages, is imprecise, misleading, or just plain wrong. Except for resources that are intended for entertainment value only, such as interactive fantasy games, information quality is the most basic evaluation criterion to consider when selecting information for young people. If the information is of low or dubious quality, the resource itself is of low or dubious quality, regardless of its strength in other areas.

Related questions to consider during resource evaluation:

- How accurate is the information provided?
- Is the information primary source or secondary source?
- For primary source information, are the research methods adequately described and explained?
- For secondary source information, are the sources of information given?
- Is the resource relatively free from typographical and grammatical errors?
- Is the information thorough, but not too thorough?
- Is the information presented in an interesting manner, but not so creatively as to obscure its meaning?
- Does the resource encourage ongoing learning, such as continued reflection and further investigation of the topics addressed?

I2. LEVEL OF DIFFICULTY OF INFORMATIONAL CONTENT

Despite the fact that few young people appraise the quality of the information that they encounter in electronic resources, many do assess its level of difficulty. Kafai and Bates (1997) found that when searching the Web, sites that used "big words...generated complaints by the [elementary school] students" (p. 108) that they studied. Wolcott's (1998) high school students also evaluated websites according to level of difficulty of content, as can be seen in the following think aloud protocol excerpt: "Well, I don't really know if I want this because this is a little bit technical for what I want to do" (p. 106). Additionally, Jacobson and Ignacio (1997) also found level of content difficulty to be important to middle school and high school Web users.

It is less common for adult information professionals to be concerned with level of informational difficulty when evaluating electronic information resources. Only three of the 14 evaluation tools linked to Evaluating the Quality of Web-Based Information (Agosto, 1999) include a criterion related to level of difficulty of informational content. Nonetheless, because this concept is so important to young information resource users, it must be considered when selecting materials for them.

Related questions to consider during resource evaluation:

- Is the information age-appropriate?
- Is the information overly simplified or overly technical?
- Is background knowledge beyond the experiences of most young people necessary to comprehend much of the content?

I3. AUTHORITY OF AUTHORING/SPONSORING BODY

Authority of the authoring or sponsoring body of an electronic information resource is another evaluation criterion of extreme importance to most information professionals, who tend to question the veracity of information based largely on the knowledge and reputation of the issuing body. Of the 14 evaluation resources in Evaluating the Quality of Web-Based Information (Agosto, 1999), 12 stress the importance of the authority of the author or sponsor. In addition, Wang and Soergel (1998) found that 11 of the 15 adult expert researchers they interviewed specifically referred to the authority of the people and organizations who originated the documents in question as an extremely significant selection factor (p. 124).

On the contrary, many young people deem all printed or electronic information to be of equal authority, without considering the source. Only one of the fifth graders that Hirsh (1998) interviewed considered authority as an evaluation criterion, and he did so only tangentially, wondering whether an indistinct photograph was correctly captioned. None of the children in the study directly questioned the authority of any authors to present information.

Related questions to consider during resource evaluation:

- Is the name of the authoring/sponsoring body readily evident?
- Is the author/sponsoring body a recognized authority in the field?
- What are the author's/sponsoring body's qualifications for presenting the information contained in the resource?
- Is a physical address for the author/sponsoring body given, or is there some other method for verifying its existence and legitimacy?

I4. CURRENCY OF INFORMATION

Information professionals often mention currency of information as one advantage of electronic information over paper-based information, which can require much more publication time. All 14 of the evaluation tools discussed in Evaluating the Quality of Web-Based Information (Agosto, 1999) address information currency. Conversely, information seeking research indicates few young people recognize that electronic information is often either outdated or that its creation date is undeterminable.

Related questions to consider during resource evaluation:

- Is the information relatively current?
- Are the dates of initial resource construction and most recent revisions included?
- Is the information updated often?
- Is currency highly important due to the subject matter (such as medical research) or less important due to the subject matter (such as ancient history)?

I5. PURPOSE OF RESOURCE

Most information professionals advise considering the reasons for which authors or sponsors create an information resource under evaluation (including 11 of the 14 Evaluating the Quality of Web-Based Information authors). Nonetheless, no major information seeking study has found that young people commonly consider these reasons. Since understanding the purpose of a resource helps to reveal its possible biases, this is an especially important criterion in the selection of materials for young people. It is also particularly important to avoid resources that force juveniles to reveal private personal data, such as home addresses and phone numbers, because information disclosure of this type can be a security risk.

Related questions to consider during resource evaluation:

- Is the purpose of the resource (e.g. public education, product marketing, political lobbying) stated?
- Are any biases toward the subject matter obvious?
- Does the resource support any social biases (e.g. gender, racial, cultural, religious, age)?
- For Web-based resources, is the user required to divulge personal information or to pay a usage fee?
- For Web-based resources, is it obvious from the domain name where the site or page originates?

D -- DESIGN EVALUATION CRITERIA

D1. QUALITY OF GRAPHIC AND MULTIMEDIA CONTENT

The more attractive a child perceives a resource to be, the higher his/her resulting evaluation. Kafai and Bates (1997) found support for the quality of graphic and multimedia content as a factor that determines elementary school children's website judgments: "Because of

their familiarity with television, the children demanded high production values; they wanted quality audio, video, and heightened interactivity" (p. 108). Fidel et al. (1999) also found quality of graphic and multimedia content to be extremely important to their young adult Web users.

It seems that few information professionals share this concern with graphic and multimedia content quality. Although many of the resources listed in Evaluating the Quality of Web-Based Information (Agosto, 1999) recommend assessing the *relevance* of graphic material to the informational content, none suggests that the *quality* of graphic and multimedia content is an important resource selection criterion. When selecting electronic resources for youth, this criterion should be considered, or the resulting selections are not likely to appeal to young users.

Related questions to consider during resource evaluation:

- Are the graphics clear and easy to understand?
- Are the audio and video components high quality?
- Is the graphic and multimedia content likely to appeal to young people?

D2. QUALITY OF GENERAL DESIGN

Various aspects of general design, such as the physical placement of items on the screen page, the use of appealing colors, and the use of easily readable type fonts, are of considerable importance both to information professionals and to young people in the evaluation of electronic information resources. Eight of the 14 evaluation tools linked to Evaluating the Quality of Web-Based Information (Agosto, 1999) recommend the quality of general design as an important evaluation criterion. Moreover, high school students in Neuman's (1993) study offered detailed suggestions for improved general design, such as improved spacing and arrangement of textual and graphic elements. However, further research is needed to clarify the role of personal preferences in design appeal.

Related questions to consider during resource evaluation:

- Is the design pleasing?
- Is the design attention-grabbing, but not distracting?
- Is the design likely to appeal to most young people?
- Are the individual pages so long that excessive scrolling is necessary?
- Is the text easy to read (based on font appearance, size, and color)?

D3. INCLUSION OF LINKS

Both young people and information professionals consider the inclusion of links to additional resources an important evaluation criterion for electronic information resources, but there are differences in the ways these two groups evaluate links. Fidel et al. (1999) and Jacobson and Ignacio (1997) found that young people typically value the *number* of links, favoring greater numbers, whereas information professionals typically value the *topicality* of links, discrediting resources with unrelated links, regardless of overall quantity. Of the 14 evaluation tools discussed

in Evaluating the Quality of Web-Based Information (Agosto, 1999), eight propose the inclusion of relevant links as a desirable resource characteristic.

Related questions to consider during resource evaluation:

- Are there a relatively large number of links?
- Are the links related to the main subjects of the resource?
- Are the links generally high quality?
- Are the links evaluated or described at all?

D4. AMOUNT OF GRAPHIC AND MULTIMEDIA CONTENT

Numerous studies have shown that young people prefer electronic information resources with a high percentage of graphic and multimedia content to those that are overwhelmingly composed of written text. Fidel et al. (1999) found this evaluation criterion to be one of the most important to the high school Web users they studied, as did Wolcott (1998). In general, young people find a high level of graphic and multimedia content to be engaging, and unembroidered narrative text to be dull. As Wolcott explained, "At the end of her search session, Kate came across an additional document that seemed pertinent, but decided not to extract because it appeared 'too boring' and devoid of pictures" (p. 137). Kafai and Bates' (1997) observed similar behaviors, concluding that "text-only sites were often left unexplored" (p. 109). Finally, Fidel et al.(1999) found that the young adults they interviewed considered excessive advertising to diminish their enjoyment of a site.

Conversely, few information professionals consider amount of graphic and multimedia content to be a significant evaluation criterion. Only one of the 14 resources linked to Evaluating the Quality of Web-Based Information (Agosto, 1999) indicates that increased graphic/multimedia content is desirable.

Related questions to consider during resource evaluation:

- Is there a relatively high percentage of graphic and multimedia content?
- Is there a relatively low percentage of advertising content?

D5. LEVEL OF INTERACTIVITY

One advantage of electronic resources over paper-based materials is the opportunity for increased interactivity. Interactivity can include inputting answers to questions, selecting from possible options to determine the outcome of a story or other narrative, playing games, chatting with celebrities or experts, and more.

In their work with high school students, Fidel et al. (1999) found support for level of interactivity as a common website evaluation principle. The young adults in their study clearly preferred highly interactive sites to non-interactive sites. Working with elementary school children, Kafai and Bates (1997) also concluded that "Children would like to see more animation and interactivity on the Internet" (p. 108).

Level of interactivity seems to be less significant to information professionals, however. Only three of the 14 resources linked to Evaluating the Quality of Web-Based Information (Agosto, 1999) list it as an evaluation criterion.

Related questions to consider during resource evaluation:

- Is there a relatively high level of interactivity?
- Is there a method for contacting the authoring/sponsoring body for questions and comments?

D6. COMPLEXITY OF ORGANIZATIONAL SYSTEM

If an information resource is too complexly organized, most juvenile users will abandon it in favor of a more simply organized tool. Eleven of the 14 resources listed in Evaluating the Quality of Web-Based Information (Agosto, 1999) specifically list complexity of organizational system as an evaluation criterion. More research is needed in this area, however, to determine what organizational patterns young users consider the most navigable.

Related questions to consider during resource evaluation:

- Is navigation within the resource fairly easy?
- Are the organization and contents obvious from the opening page?
- Is there a link to the opening page on each subsequent page?
- If the resource is large, is an internal search function available?

W -- WORKABILITY EVALUATION CRITERIA

W1. LOADING SPEED

A common complaint with juvenile electronic information resource users is lengthy loading times. Single pages with numerous large graphics, especially animated pictures, often load excessively slowly. Downloading large audio and video files can also be annoyingly slow. Both Fidel et al. (1999) and Hirsh (1998) identified slow loading as a source of considerable frustration for young Web users, and half of the 14 resources listed in Evaluating the Quality of Web-Based Information (Agosto, 1999) advise avoiding resources with slow loading speeds.

Related questions to consider during resource evaluation:

- Is the loading speed relatively fast?
- Does the graphic content load a long time after the narrative content has loaded?

W2. WORKABILITY OF LINKS

In addition to stressing the significance of link topicality, half of the 14 resources listed in Evaluating the Quality of Web-Based Information (Agosto, 1999) emphasize that all links should be operational. Numerous inoperative links can indicate that a resource is poorly maintained, casting doubt on the quality of its information. Dead links can also be a source of user frustration.

Related questions to consider during resource evaluation:

- Are there many dead links?
- Are the links compatible with most personal computer systems?
- Do the links require proprietary software?
- Do they require helper applications or plug-ins?

W3. GENERAL WORKABILITY

Eight of the 14 resources listed in Evaluating the Quality of Web-Based Information (Agosto, 1999) include evaluation criteria concerning general workability issues, such as compatibility with most personal computer systems, provisions for special needs users, and availability problems due to heavy traffic. General workability is especially important in school settings, where computer time and computer access are often limited. This criterion is also of exceptional importance to users with disabilities.

Related questions to consider during resource evaluation:

- Is the resource compatible with most personal computer systems?
- Is proprietary software needed? Are helper applications or plug-ins needed?
- For Web-based resources, can both text browsers and graphics browsers run the site or page?
- For Web-based resources, is the site or page almost always available, or are there frequent or extended periods of unavailability?
- For Web-based resources, do heavy traffic and/or limited connections often preclude access?
- For Web-based resources, are there options for downloading and running text-only and non-frame versions?
- Are there large print or audio options for the visually impaired?
- Are there textual descriptions of graphics for screen readers to read?
- Is it necessary to change system configuration for printing purposes?

EVALUATING ELECTRONIC INFORMATION RESOURCES FOR YOUNG WOMEN: SUGGESTED CD-ROMS, BASED ON EVALUATION ACCORDING TO THE GENDER-SPECIFIC CRITERIA

Few (if any) information resources are strong on all eight of the gender-specific evaluation criteria. The following CD-ROMs are examples of resources that are strong on *many* of these criteria, making them useful tools for encouraging young women to explore science and technology disciplines. Ratings for each of the gender-specific criteria accompany each CD-ROM description listed below.

Similarly, evaluation of existing science and technology websites indicates that exceedingly few are strong on all of the gender-specific criteria. It seems likely that electronic information resources, even those specifically designed for young female audiences, do not meet all of these criteria simply because this original research has not yet been widely published or publicized, making CD-ROM and website designers unfamiliar with these findings. Since so few resources do stand up against all of the gender-specific criteria, it is likely that future publication and promotion of the Leading Young Women to the Sciences and Technology Part II research will make a strong impact on systems design practices, resulting in the production of electronic information resources with much greater appeal to young women than those that exist today.

BIOLOGY

The Digital Frog 2
Grades 8 - 12. Published by Digital Frog, this electronic dissection tool allows users to electronically slice open a frog and perform a guided dissection. Although weak on some of the gender-specific criteria (including social connectivity, contextuality, and personal identification), the high quality graphics make it the best of the available CD-ROM dissection kits.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: weak flexibility, strong motility
Contextuality: weak
Personal Identification: weak
Inclusion: average
Confidence: average
Graphic/Multimedia Concentration: strong

CHEMISTRY

Futurelab: Ideal Gas
Grades 10 & up. This Simulations Plus publication is a virtual chemistry lab that enables students to replicate famous chemistry experiments and to create their own original experiments. Because there is no guided tour there is a relatively high learning curve, but once familiar with the lab, students will find it facilitates self-directed, inquiry based learning. The ability to place objects on the screen and move them freely makes this resource an exceptional example of strong motility. Other entries in the FutureLab: Optics for Physical Science series include biology, earth science, and physics labs.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: strong

Contextuality: average
Personal Identification: average
Inclusion: average
Confidence: strong
Graphic/Multimedia Concentration: strong

GENERAL SCIENCE

Women in Science
Grades 5 - 12. Published by Tom Snyder. This resource profiles eight contemporary women scientists through biographies, interviews, and interactive experiments related to their work. An excellent program overall, Women in Science is exceptionally strong on role playing, personal identification, and inclusion.

Collaboration: average
Social Connectivity: average
Flexibility/Motility: strong
Contextuality: strong
Personal Identification: strong
Inclusion: strong
Confidence: strong
Graphic/Multimedia Concentration: average

SetQuest
Grades 7 - 12. This partially NSF-funded set of CD-ROMs consists mainly of short videos that describe various science and technology careers. Published by Learning in Motion, an interactive activity is included with each career profile. For example, the veterinarian profile includes a role playing game in which the user must select a treatment method for a sick bird.

Collaboration: average
Social Connectivity: average
Flexibility/Motility: average
Contextuality: strong
Personal Identification: strong
Inclusion: strong
Confidence: strong
Graphic/Multimedia Concentration: strong

GEOLOGY/GEOGRAPHY/ENVIRONMENTAL SCIENCE/WEATHER

The Digital Field Trip to the Rainforest
Grades 6 - 12. This Digital Frog International CD-ROM takes users on a virtual walking tour of the Blue Creek Rainforest Reserve in Belize. Strong on graphic/multimedia concentration, The Digital Field Trip to the Rainforest includes a helpful introductory tour.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: strong
Contextuality: average
Personal Identification: strong
Inclusion: average
Confidence: average

Graphic/Multimedia Concentration: strong

Ocean Expeditions El Niño
Grades 6 - 12. In this Tom Snyder publication, students work in collaborative research crews of four to complete an extended inquiry-based classroom activity. Each team investigates weather patterns from an ocean ship using various scientific tools and conducting both online and library research. A virtual narrator/host gives positive feedback on the team's answers to various open-ended research and thinking questions, making this resource strong on flexibility.

Collaboration: strong
Social Connectivity: average
Flexibility/Motility: strong
Contextuality: strong
Personal Identification: strong
Inclusion: strong
Confidence: strong
Graphic/Multimedia Concentration: strong

Microsoft Oceans
Grades 3 & up. This Microsoft CD-ROM is a very general tool about sea life. With numerous game components and sharply detailed photographs and videos, Microsoft Oceans exemplifies strong interactivity and strong graphic and multimedia concentration.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: strong
Contextuality: strong
Personal Identification: average
Inclusion: average
Confidence: average
Graphic/Multimedia Concentration: strong

MATHEMATICS

Math Blaster Geometry
Gr. 9-12. Students join spunky Andi and her robotic sidekick Zoid as they solve geometry problems in an attempt to save Zoid's homeland from being destroyed. Users can choose from three levels of difficulty, as well as choosing between textbook-type lessons and problems and less traditional problem-driven interactive games. Math Blaster Algebra is also available.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: weak
Contextuality: strong
Personal Identification: average
Inclusion: strong
Confidence: average
Graphic/Multimedia Concentration: average

TECHNOLOGY/ENGINEERING

Widget Workshop - The Mad Scientist's Laboratory

Grades: 3 - 12. This largely unstructured program, published by Maxis, allows young scientists to create limitless inventions using parts such as cogs, wheels, electronic conductors, gravity chambers, digital counter displays, and much more. With entertaining sound effects and animation, this program allows young users to email their inventions to friends, making it especially strong on social connectivity.

Collaboration: average
Social Connectivity: strong
Flexibility/Motility: strong
Contextuality: strong
Personal Identification: strong
Inclusion: average
Confidence: strong
Graphic/Multimedia Concentration: strong

Sim City

Grades: 6 & up. In another high quality Maxis product, young users design and manage imaginary communities. Although it has a very high learning curve, the help menus serve as a tutorial. This is a fascinating resource that teaches students the importance and delicacies of civil engineering.

Collaboration: average
Social Connectivity: average
Flexibility/Motility: strong
Contextuality: strong
Personal Identification: strong
Inclusion: average
Confidence: average
Graphic/Multimedia Concentration: average

EVALUATING ELECTRONIC INFORMATION RESOURCES FOR YOUNG WOMEN: SUGGESTED WEBSITES, BASED ON EVALUATION ACCORDING TO THE GENDER-SPECIFIC CRITERIA

Each of the following websites is either strong on many of the gender-specific criteria or exceptionally strong on one particular criterion, such as **Chemistry Experiments You Can Do at Home**, which serves as a rare example of strong motility but is weak or average on the remaining six criteria. Degree ratings for each of the eight gender-specific criteria accompany these website descriptions.

ASTRONOMY

Solar System Simulator (http://space.jpl.nasa.gov)
Grades 4 & up. **The Solar System Simulator**, created by NASA with assistance from Jet Propulsion Labs and Caltech, produces full-color representations of planets and satellites, as seen from other planets and satellites, at whatever day, year, and hour the user chooses. Thus, users can view Mars from Jupiter during the hour they were born, or the Earth as viewed from the Galileo Spacecraft right now, or the moon as viewed from Titania two hundred years from now.

Collaboration: average
Social Connectivity: average
Flexibility/Motility: strong
Contextuality: weak
Personal Identification: average
Inclusion: average
Confidence: average
Graphic/Multimedia Concentration: strong

Auroras: Paintings in the Sky (http://www.exploratorium.edu/learning_studio/auroras)
Grades 8 & up. Developed by a high school teacher and the San Francisco Exploratorium museum staff, this site introduces students to auroras through a self-guided tour. The high quality photographs, audio clips, and videos are sure to interest young people in these beautiful atmospheric lights.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: strong
Contextuality: strong
Personal Identification: strong
Inclusion: average
Confidence: average
Graphic/Multimedia Concentration: strong

J-Track Satellite Tracking (http://liftoff.msfc.nasa.gov/RealTime/JTrack/)
Grades 5 & up. Another fine NASA site, this resource allows space enthusiasts to track the movement and positions of the their favorite spacecraft, weather patterns, search satellites, and amateur radio enthusiast satellites. A must for astronomy lovers.

Collaboration: average
Social Connectivity: average
Flexibility/Motility: strong
Contextuality: weak
Personal Identification: strong
Inclusion: average
Confidence: strong
Graphic/Multimedia Concentration: strong

BIOLOGY/GENETICS

Sheep Brain Dissection (http://www.exploratorium.edu/memory/braindissection/index.html)
Grades 6 & up. In response to the popularity of the Exploratorium's sheep brain dissection exhibit, the museum has created this interactive, virtual dissection for young people who cannot visit the museum itself. Much quicker and less detailed than available CD-ROM dissection tools, this site is more appropriate for leisure use than for formal school study.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: weak
Contextuality: average
Personal Identification: average
Inclusion: strong
Confidence: average
Graphic/Multimedia Concentration: strong

DNA for Dinner (http://www.gis.net/%7Epeacewp/webquest.htm)
Grades 9 & up. In this collaborative classroom activity, groups of students work together to analyze issues surrounding the genetic engineering of food. Based on their research efforts, students present their findings to their group members, and each group then writes a related congressional bill. Although this site is a good example of strong collaboration, a rigid grading rubric makes it weak on flexibility.

Collaboration: strong
Social Connectivity: strong
Flexibility/Motility: weak
Contextuality: strong
Personal Identification: strong
Inclusion: average
Confidence: strong
Graphic/Multimedia Concentration: average

DNA from the Beginning (http://vector.cshl.org/dnaftb/asp/splashtable.asp)
Grades 6 & up. This introduction to genetics is largely a tribute to Mendel's work. It includes text, photographs, illustrations, animation, audio clips, video clips, and an animated, interactive genetics problem to solve.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: weak
Contextuality: strong
Personal Identification: average
Inclusion: average
Confidence: average
Graphic/Multimedia Concentration: strong

The Digital First 9 Months (http://www.pregnancycalendar.com/first9months)
Grades 9 & up. Especially strong on contextuality and graphic/multimedia concentration, this site follows the prenatal development of Emma Katherine Moore, born in January of 1999. Simple text and stunning photographs transform the nine-month human development process into a tender and fascinating story. However, this site may load slowly on some computers.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: weak
Contextuality: strong
Personal Identification: average
Inclusion: average
Confidence: average
Graphic/Multimedia Concentration: strong

CHEMISTRY

Chemistry Experiments You Can Do at Home
(http://library.thinkquest.org/2690/exper/exper.htm)
Grades 5 & up. This collection of fairly simple experiments offers relatively complex explanations of the chemical processes involved. Strong on motility in its connection to the physical world, this resource is useful for encouraging reluctant science students to take an interest in chemistry.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: strong
Contextuality: average
Personal Identification: average
Inclusion: average
Confidence: average
Graphic/Multimedia Concentration: average

Polymers: They're Everywhere
(http://www.nationalgeographic.com/resources/ngo/education/plastics/index.html)
Grades 3 - 8. **Polymers: They're Everywhere** is a National Geographic site that presents a basic discussion of polymers in everyday life. It also includes a section on recycling plastics.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: strong
Contextuality: strong
Personal Identification: strong
Inclusion: strong
Confidence: average
Graphic/Multimedia Concentration: strong

Marie Curie and the History of Radioactivity
(http://www.nmsi.ac.uk/collections/exhiblets/curie/start.htm)
Grades 4 & up. This short but interesting biography of Marie Curie has links to her husband's and daughter's biographies. It also includes electronic copies of personal archival objects, such as family photographs and a glass beaker that Curie used in her lab.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: weak
Contextuality: strong
Personal Identification: average
Inclusion: strong
Confidence: average
Graphic/Multimedia Concentration: average

COMPUTER SCIENCE

An Atlas of Cyberspaces (http://www.cybergeography.org/atlas/atlas.html)
Grades 10 & up. This site describes itself as "an atlas of maps and graphic representations of the geographies of the new electronic territories of the Internet, the World-Wide Web and other emerging Cyberspaces." Its emphasis on visually-based information and de-emphasis on text-based information make it a fine example of graphic/multimedia concentration.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: strong
Contextuality: weak
Personal Identification: weak
Inclusion: average
Confidence: average
Graphic/Multimedia Concentration: strong

GENERAL SCIENCE

Popular Science's Best of What's New 1999 (http://www.popsci.com/features/bown/bown99/)
Grades 8 & up. In this 12th annual collection, users can see and read about amazing new scientific and technological products. Items profiled include robotic dogs, avalanche survival gear, and brain cell repair medicine.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: strong
Contextuality: strong
Personal Identification: average
Inclusion: average
Confidence: average
Graphic/Multimedia Concentration: strong

Women in Science (http://library.thinkquest.org/20117/index.html)
Grades 6 & up. In addition to illustrated biographies of past and current female scientists, **Women in Science** contains a "Future Scientists" section into which a student can enter her name, school, school URL, and an explanation of how she plans to affect science in the future.

Collaboration: average
Social Connectivity: strong
Flexibility/Motility: average
Contextuality: strong
Personal Identification: strong
Inclusion: strong
Confidence: strong
Graphic/Multimedia Concentration: strong

The Exploratorium's Online Exhibits (http://www.exploratorium.edu/exhibits/index.html)
Grades 3 -10. This collection of online science exhibits is comprised of informative and fun little science bites. For example, "If You're Going to Rob a Bank, Wear a Wig," mixes and matches partial photographs of famous people's heads (such as Washington's face with Elvis' hair) to show that human memories tend to store more detailed information about upper sections of faces than lower sections.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: strong
Contextuality: average
Personal Identification: strong
Inclusion: average
Confidence: average
Graphic/Multimedia Concentration: average

The Why Files (http://whyfiles.news.wisc.edu/)
Grades 10 & up. Characterized by a folksy narrative style and well-researched information, this site reveals the science, math, and technology behind the news. For example, enormous headlines

reading, "I lost 84 lbs. in 7 days!" and "I chewed my way into a size 2!" introduce a section dedicated to the chemicals used in weight loss drugs.

Collaboration: average
Social Connectivity: strong
Flexibility/Motility: strong
Contextuality: strong
Personal Identification: strong
Inclusion: average
Confidence: strong
Graphic/Multimedia Concentration: average

The Mad Scientist Network (http://www.madsci.org)
Grades K & up. Drawing on a volunteer crew of more than 500 scientists across the globe, **The Mad Scientist Network** answers online science queries. An archive of past answers is also available for searching. With its emphasis on connecting youth and scientists through electronic means, this site is a prime example of strong social connectivity.

Collaboration: average
Social Connectivity: strong
Flexibility/Motility: strong
Contextuality: average
Personal Identification: strong
Inclusion: strong
Confidence: strong
Graphic/Multimedia Concentration: average

Boston Museum of Science Online Exhibits (http://www.mos.org/exhibits/online_exhibits.html)
Grades 6 & up. These online exhibits are notable for their easy-to-use self-paced tours, the depth of the information provided, and an intense use of graphic and multimedia content. Because of its high quality photographs and animated gifs, Leading Young Women to the Sciences and Technology focus group participants found this site to be especially strong on design.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: strong
Contextuality: strong
Personal Identification: average
Inclusion: average
Confidence: average
Graphic/Multimedia Concentration: strong

Extreme Science (http://www.extremescience.com/)
Grades 7 & up. Ex-NASA scientist Elizabeth Keller created **Extreme Science** as a resource for helping young people learn to love science. Using the concepts of superlative size, power, speed, etc., as hooks, this site covers the topics of time, space, weather, earth science, creatures, and maps and atlases.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: strong
Contextuality: average
Personal Identification: weak

Inclusion: average
Confidence: average
Graphic/Multimedia Concentration: strong

GEOLOGY/GEOGRAPHY/ENVIRONMENTAL SCIENCE/WEATHER

Topo Zone (http://www.topozone.com/)
Grades 6 & up. Calling itself "The Web's first interactive topo map of the entire United States," **Topo Zone** provides U.S. topographical maps in various magnifications and sizes. Because it allows the user to move freely from map to map without a prescribed search path, this site is exemplifies strong flexibility.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: strong
Contextuality: weak
Personal Identification: average
Inclusion: average
Confidence: average
Graphic/Multimedia Concentration: strong

Shell Island Dilemma (http://www.ncsu.edu/coast/shell/index.html)
Grades 4 - 11. This extended-length classroom activity is an environmental pollution case study. Since students work in teams to make development and conservation decisions, this resource is strong on collaboration. However, users of some computer systems may find its video clips to load extremely slowly.

Collaboration: strong
Social Connectivity: average
Flexibility/Motility: weak
Contextuality: strong
Personal Identification: strong
Inclusion: average
Confidence: strong
Graphic/Multimedia Concentration: strong

Xpeditions (http://www.nationalgeographic.com/xpeditions)
Grades K - 12. National Geographic's **Xpeditions** is an enormous and varied resource for studying the earth and its people. Of particular interest is a 3-D virtual version of the Society's Explorer's Hall, located in Washington D.C. Users can navigate the virtual museum to visit its many online science exhibits.

Collaboration: average
Social Connectivity: strong
Flexibility/Motility: strong
Contextuality: strong
Personal Identification: average
Inclusion: average
Confidence: average
Graphic/Multimedia Concentration: strong

MATHEMATICS

Professor Freedman's Math Help (http://www.geocities.com/%7Emathskills/)
Grades 10 & up. Professor Ellen Freedman suggests helpful methods for learning basic math and algebra concepts and for overcoming math anxiety. Her friendly, direct narrative style will certainly help apprehensive math students to gain confidence in their abilities.

Collaboration: average
Social Connectivity: average
Flexibility/Motility: strong
Contextuality: strong
Personal Identification: strong
Inclusion: strong
Confidence: strong
Graphic/Multimedia Concentration: strong

Biographies of Women Mathematicians
(http://www.agnesscott.edu/lriddle/women/women.htm)
Grades 4 & up. This very comprehensive resource includes short, traditional biographies of women mathematicians from the 5th century BCE until modern times. It was created and is maintained by faculty at Agnes Scott College in Atlanta, GA.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: strong
Contextuality: strong
Personal Identification: average
Inclusion: strong
Confidence: average
Graphic/Multimedia Concentration: weak

Statistics (http://www.learner.org/exhibits/statistics/)
Grades 9 & up. This Annenberg/CPB Multimedia project traces political polling results during a year-long fictional mayoral race to teach the user about the role of statistics in everyday life. By presenting statistical information in a story format, instead of in a more textbook-ish style, this resource epitomizes strong contextuality.

Collaboration: average
Social Connectivity: average
Flexibility/Motility: average
Contextuality: strong
Personal Identification: strong
Inclusion: average
Confidence: average
Graphic/Multimedia Concentration: weak

MEDICINE/ANATOMY

Medical Ethics (http://www.learner.org/exhibits/medicalethics/)
Grades 9 & up. Another fine offering from Annenberg/CPB Multimedia, **Medical Ethics** demonstrates strong personal identification. Throughout the site, the user plays the role of doctor, making difficult medical and ethical decisions.

Collaboration: average

Social Connectivity: strong
Flexibility/Motility: average
Contextuality: strong
Personal Identification: strong
Inclusion: strong
Confidence: strong
Graphic/Multimedia Concentration: average

Neuroscience for Kids (http://faculty.washington.edu/chudler/neurok.html)
Grades 7 & up. Maintained by Eric H. Chudler of the University of Washington and supported by a Science Education Partnership Award from the National Center of Research Resources, this site teaches young people about the brain and about the field of neuroscience in general. Best of all, **Neuroscience for Kids** combines interactive experiments, activities, and games with detailed scientific information.

Collaboration: average
Social Connectivity: strong
Flexibility/Motility: strong
Contextuality: average
Personal Identification: average
Inclusion: average
Confidence: average
Graphic/Multimedia Concentration: average\

Doctors over Time (http://www.pbs.org/wgbh/aso/tryit/doctor/)
Grades 4 & up. This PBS Science Odyssey activity uses interactive Shock Wave technology to show how a doctor working in 1900, a doctor working in 1950, and a doctor working in 1998 would diagnose and treat three different medial ailments. The activity is available in a non-java-based version for users with older browsers.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: strong
Contextuality: strong
Personal Identification: strong
Inclusion: strong
Confidence: average
Graphic/Multimedia Concentration: strong

PHYSICS

Amusement Park Physics (http://www.learner.org/exhibits/parkphysics)
Grades 7 & up. **Amusement Park Physics** takes users on a tour of the basic physical principles at work in an amusement park. An interactive activity allows users to design and test their own roller coaster designs.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: weak
Contextuality: strong
Personal Identification: strong
Inclusion: average

Confidence: average
Graphic/Multimedia Concentration: weak

Time Travel (http://www.pbs.org/wgbh/nova/time/)
Grades 8 & up. This PBS NOVA site deals with the scientific possibility of time travel. Highlights include an interview with Carl Sagan and a history of time travel in science fiction literature. Unfortunately, the "Think Like Einstein" quiz section allows for no flexibility whatsoever, with only one correct answer per question.

Collaboration: average
Social Connectivity: average
Flexibility/Motility: weak
Contextuality: strong
Personal Identification: average
Inclusion: weak
Confidence: average
Graphic/Multimedia Concentration: strong

Contributions of Women to Physics (http://www.physics.ucla.edu/~cwp/)
Grades 6 & up. This well-designed site allows users to select multiple paths for investigating biographies of female physicists. Since it profiles women physicists exclusively, it is very strong on inclusion.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: strong
Contextuality: average
Personal Identification: average
Inclusion: strong
Confidence: average
Graphic/Multimedia Concentration: weak

PSYCHOLOGY/HUMAN PERCEPTION

The Soundry (http://library.advanced.org/19537/)
Grades 5 & up. Created by high school students, **The Soundry** uses interactive examples and activities to explain what sound is and how the human ear perceives it. The sound studio lab is especially interesting.

Collaboration: average
Social Connectivity: average
Flexibility/Motility: average
Contextuality: strong
Personal Identification: average
Inclusion: average
Confidence: average
Graphic/Multimedia Concentration: strong

Personality (http://www.learner.org/exhibits/personality/)
Grades 8 - 12. This basic introduction to human personality includes a pop personality quiz that is sure to interest young users. Other similar activities throughout the site make it strong on personal

identification.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: average
Contextuality: strong
Personal Identification: strong
Inclusion: average
Confidence: average
Graphic/Multimedia Concentration: average

TECHNOLOGY/ENGINEERING

Inventors Online Museum (http://www.inventorsmuseum.com/)
Grades 3 & up. With an attractive design, moving images, and entertaining sound effects, the **Inventors Online Museum** profiles famous and not-so-famous inventors and their inventions. Sections dedicated to African American inventors and to women inventors make this resource a good example of strong inclusion.

Collaboration: average
Social Connectivity: weak
Flexibility/Motility: average
Contextuality: strong
Personal Identification: average
Inclusion: strong
Confidence: average
Graphic/Multimedia Concentration: strong

Furby Autopsy (http://www.phobe.com/furby/index.html)
Grades 10 & up. When the creators of this irreverent site found that their new Furby malfunctioned less than a week after they had purchased it, they decided to deconstruct the toy and to examine its mechanical insides. Luckily for technology enthusiasts worldwide, the site owners then posted their **Furby Autopsy** on the Web. Due to the fairly technical nature of some of the autopsy sections, this resource will be best appreciated by young people with strong groundings in mechanics and computer technology.

Collaboration: average
Social Connectivity: average
Flexibility/Motility: average
Contextuality: strong
Personal Identification: strong
Inclusion: average
Confidence: strong
Graphic/Multimedia Concentration: strong

Technology at Home (http://www.pbs.org/wgbh/aso/tryit/tech/)
Grades 4 - up. In another of its many outstanding sites, PBS presents a tour of twentieth-century technological advances for the home. For example, as the years pass, users see (and read about) the gramophone being replaced by the early electric phonograph, which is replaced by the stereographic phonograph, which is then replaced by the CD player.

Collaboration: average
Social Connectivity: weak

Flexibility/Motility: strong
Contextuality: strong
Personal Identification: strong
Inclusion: weak
Confidence: average
Graphic/Multimedia Concentration: strong

REFERENCES

Agosto, D. E. (1999). Evaluating the Quality of Web-Based Information. Available at: (http://scils.rutgers.edu/special/dagosto/criteria.html).

Bem, S. L. (1987). Gender schema theory and its implications for child development: Raising gender-aschematic children in a gender-schematic society. In M. R. Walsh (Ed.), The psychology of women: Ongoing debates (pp. 245-266). New Haven, CT: Yale.

Brunner, C., Bennett, D., Honey, M. (1998). Girl games and technological desire. In J. Cassell, & H. Jenkins (Eds.), From Barbie to Mortal Kombat: Gender and computer games (pp. 72-88). Cambridge, MA: MIT.

Burdick, T. A. (1996). Success and diversity in information seeking: Gender and the information search styles model. School Library Media Quarterly, 25(1), 19-27.

Cassell, J., & Jenkins, H. (1998). Chess for girls? Feminism and computer games. In J. Cassell, & H. Jenkins (Eds.), From Barbie to Mortal Kombat: Gender and computer games (pp. 2-45). Cambridge, MA: MIT.

Comber, C., Colley, A., Hargreaves, D. J., & Dorn, L. (1997). The effects of age, gender and computer experience upon computer attitudes. Educational Research, 39, 123-133.

Fidel, R, Davies, R. K., Douglass, M. H., Holder, J. K., Hopkins, C. J., Kushner, E. J., Miyagishima, B. K., & Toney, C. D. (1999). A visit to the information mall: Web searching behavior of high school students. Journal of the American Society for Information Science, 50, 24-37.

Harding, S. G. (1991). Whose science? Whose knowledge? Thinking from women's lives. Ithaca, NY: Cornell University.

Honey, M., Moeller, B., Brunner, C., Bennett, D., Clements, P., & Hawkins, J. (1991). Girls and design: Exploring the question of technological imagination. Center for Technology in Education Technical Report No. 17, 1-12.

Jacobson, F. F., & Ignacio, E. N. (1997). Teaching reflection: Information seeking and evaluation in a digital library environment. Library Trends, 45, 771-802.

Kafai, Y., & Bates, M. J. (1997). Internet Web-searching instruction in the elementary classroom: Building a foundation for information literacy. School Library Media Quarterly, 25, 103-111.

Lage, M. J., & Treglia, M. (1998). Gender and active learning. In Becker, W. E., & Watts, M. (Eds.), Teaching economics to undergraduates: Alternatives to chalk and talk (35-480. Cheltenham, UK: Edward Elgar.

Martin, S. (1998). Internet use in the classroom: The impact of gender. Social Science Computer Review, 16, 411-418.

Mayberry, M. (1999). Reproductive and resistant pedagogies: The comparative roles of collaborative learning and feminist pedagogy in science education. In M. Mayberry, & E. C. Rose (Eds.), Meeting the challenge: Innovative feminist pedagogies in action (pp. 2-22). New York: Routledge.

Miller, L., Chaika, M., & Groppe, L. (1996). Girls' preferences in software design: insights from a focus group. Interpersonal Computing and Technology: An Electronic Journal for the 21st Century, 4(2), 27-36.

Neuman, D. (1993). Designing databases as tools for higher-level learning: Insights from instructional systems design. Educational Technology Research and Development, 41(4), 25-46.

Opie, C. (1998). Whose turn next? Gender issues in information technology. In A. Clark, & E. Millard (Eds.), Gender in the secondary curriculum: Balancing the books (pp. 80-95). London: Routledge.

Roychoudhury, A., Tippins, D. J., & Nichols, S. E. (1995). Gender-inclusive science teaching: A feminist-constructivist approach. Journal of Research in Science Teaching, 32, 897-924.

Scaife, J. (1998). Science education for all? Towards more equitable science education. In A. Clark, & E. Millard (Eds.), Gender in the secondary curriculum: balancing the books (pp. 60-79). London: Routledge.

Schofield, J. W. (1995). Computers and classroom culture. New York: Cambridge.

Seymour, E., & Hewitt, N. M. (1997). Talking about leaving: Why undergraduates leave the sciences. Boulder, CO: Westview.

Subrahmanyam, K., & Greenfield, P. M. (1998). Computer games for girls: What makes them play? In J. Cassell, & H. Jenkins (Eds.), From Barbie to Mortal Kombat: Gender and computer games (pp. 46-71). Cambridge, MA: MIT.

Turkle, S. (1988). Computational reticence: Why women fear the intimate machine. In C. Kramarae (Ed.), Technology and women's voices: Keeping in touch (pp. 41-61). New York: Routledge.

Walford, G. (1981). Do chemistry textbooks present a sex-biased image? Education in Chemistry, 1.

Wolcott, M. S. (1998). Information seeking and the World Wide Web: A qualitative study of seventh grade students' search behavior during an inquiry activity. Unpublished doctoral dissertation, University of San Francisco, San Francisco.

Wang, P., & Soergel, D. (1998). A cognitive model of document use during a research project. Study I. Document selection. Journal of the American Society for Information Science, 49, 115-133.