EFFECTIVE SCIENCE COMMUNICATION TO CHILDREN

VIA A HEALTH-RELATED WEB SITE

A Thesis

by

SABRA LADD GORE

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

August 2003

Major Subject: Science and Technology Journalism

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Approved as to style and content by:

Lynne Walters (Chair of Committee)	Douglas Starr (Member)
Fuller Bazer (Member)	Leroy G. Dorsey (Head of Department)

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ABSTRACT

Effective Science Communication to Children

via a Health-Related Web Site. (August 2003)

Sabra Ladd Gore, B.A., Texas A&M University

Chair of Advisory Committee: Dr. Lynne Walters

This study assesses one Web site, Veggie-mon.org. This Web site aims to effectively communicate health information to children, resulting in user learning and an intent to change health behavior. Fourth-through eighth-grade pupils were interviewed before and after perusing the Web site for up to 20 minutes, and then they participated in focus groups. A majority of participants learned what the Web site was about, had previous health knowledge reinforced, discovered new health information, and said it made a difference in their health choices. Readability tests performed on seven text passages on the site indicated seventh- and eighth-grade reading levels, which is too high for the majority of the targeted audience.

To My Family

This document is dedicated to my family. My deepest appreciation goes to my husband, Kenny Gore, for his encouragement, for his patience, and for his taking-up-the-slack while I sat for hours in front of the computer. My appreciation also goes to my children: Amanda, Jacob, Levi, Kendra, and Caleb. They diligently carried on when I wore the “Student” hat instead of the “Mom” hat. Finally, my appreciation goes to my parents, Kenneth and Sandra Ladd, who have loved and supported me, and cheered me on, through this challenge and a multitude of others.

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INTRODUCTION

As the Internet weaves its web throughout the world, communication rises to a level of unprecedented mass and immediacy. Communicators, both senders and receivers, become insatiably hungry for instant information. In the rush, along with the good comes the bad: inaccuracy, data dumping, misleading information, and ineffective communication—sometimes purposeful. Fortunately, studies show that strides are being made to implement self-imposed criteria to ensure helpful, trustworthy, and interesting Web sites.

The Nielsen//NetRatings (2003a) estimates more than 400 million World Wide Web sites on the Internet, and 248 million of them were active during March 2003, which is 4.7 million more than in the previous month (see Table 1). While the number of Web sites grew, the time

TABLE 1
Global Internet Index: Average Usage (Nielsen)
Month of March 2003

	March	*February*	*% Change*
Number of Sessions per Month	22	21	6.00
Number of Unique Domains Visited	55	52	5.71
Page Views per Month	898	843	6.44
Page Views per Surfing Session	41	41	0.41
Time Spent per Month	11:54:51	11:14:15	6.02
Time Spent During Surfing Session	00:32:48	00:32:48	0.02
Duration of a Page Viewed	0:00:48	0:00:48	-0.39
Active Internet Universe	247,256,506	242,481,279	1.97
Current Internet Universe Estimate	402,252,648	401,472,190	0.19

spent viewing them changed little or not at all. Web publishing grows, but its audience continues to search for specific interests. Making the search difficult are the sites containing incomplete, misleading, or inaccurate information that exist along with sites containing complete, authentic,

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This thesis follows the style and format of *Science Communication*.

and accurate information (Hong and Cody 2002). The challenge is to distinguish “the wheat from the chaff” (Silberg, Lundberg, and Musacchio 1997).

Web sites vie for an audience, and many are successful. Kahn (2000) described the success of the Medical College of Wisconsin HealthLink Web site. In January 2000, it had 66,067 distinct users who accessed 292,507 documents. Its e-mail newsletter had more than 22,000 subscribers. More recently, working Americans turned to the Web for information on Severe Acute Respiratory Syndrome (SARS) during the week ending April 6, 2003. Traffic to the MSN (Microsoft Network) Health with WebMD site and to the U.S. Center for Disease Control and Prevention site, both of which had SARS news, rose 62% and 58%, respectively. The U.S. National Institutes of Health site, which had SARS information on its home page, experienced 16% more traffic (Nielsen//NetRatings 2003b).

Cassell, Jackson, and Cheuvront (1998) likened the Web, a relatively new and unregulated medium, to traditional mass media formats in that it has the capacity to economically reach large and geographically diffuse audiences. Television, radio, print media, and the Web communicate in unique ways. But Borzekowski and Rickert (2001a) contrasted the Web from traditional mass media formats in that it reaches narrowly targeted audiences with countless insights on a range of personal and social concerns, especially audiences of children and young people who are familiar with the Web. Kahn (2000) likened the Information Age changes on the world to the Industrial Age changes, the use of information technology to create individually tailored solutions. New terms are born, such as mass customization—the combining of efficiencies of mass production with the ability to meet the individual’s needs.

Mass customization poses the challenge of reaching the mass with personal messages that are comprehensible, accurate, and authoritative; otherwise, it is mere chaff. To remain unregulated, Web publishers carry the responsibility of making their sites worthy of viewing, since “correct information and incorrect information both glow on the computer screen with exactly the same intensity” (Koop 1999).

Web Medium

Previous studies characterize the Web with words such as empowering, immediate, customizable, interconnective, personal, interactive, powerful, and mass communication (Peattie 2002; Hong and Cody 2002; Cassell, Jackson, and Cheuvront 1998). If these words accurately describe the Web, then it makes sense that so many are flocking to this electronic medium to communicate health information, giving rise to a new word: “e-health.” Eysenbach (2001) listed ten characteristics that *should* be associated with e-health: efficiency (decreased costs), enhancing quality (competition and ability to compare), evidence based (proven), empowerment (knowledge), encouragement (relationships bolstered by on-line communication), education, enabling (information exchange and on-line communication), extending (no boundaries), ethics, and equity (equal access).

Using their own health-related Web site as an example, Dyer et al. (1998) addressed two e-health characteristics, extending and equity. They wrote that the Web offers 24-hour availability to anyone who has access, irrespective of socioeconomics and geography, and can be experienced in color, and with sound, images, and interactivities. Oenema, Brug, and Lechner (2001) wrote that *only* those with access to the Internet can see a Web site, and many of those depend largely on the result of specific keyword searches. Maybe socioeconomics does matter, such as whether home Web access is feasible or possible. The availability of Web access at public libraries, friends’ and families’ homes, copy centers, schools, and so on challenges that hypothesis.

The e-health characteristic enhancing quality includes competition to attract health information seekers. Hong and Cody (2002), who studied the presence of pro-tobacco messages on the Web, found that the Web is being used as a powerful medium by which to disseminate messages and images for influencing the public, especially using interactive elements. The public, on the other hand, may judge the Web differently from other forms of media because it is a relatively new source, and users may recognize the wide variations in the quality of information (Treise et al. 2003). Interactivity may be a double-edged sword. Some authors warn that it requires the use of higher cognitive resources. Still, the Web is a dynamic medium for influencing learning and for attitude change and behavior (Stout, Villegas, and Kim 2001), which is why a growing number of elementary schools are using the Web (National Center for Education Statistics 2003).

Digital Divide

Much data have been collected during various studies on how much children are using a computer and the Web, as well as where and why. One study found that 68% of 10–17 year-old children use a home computer at least once a week, 58% use a school computer at least once a week, and 61% use the Web at home or at school at least once a week (Brodie et al. 2000). A second study found that 61% of girls use a home computer at least once a week and 18% use a school computer at least once a week; and that 71% of boys use a home computer at least once a week and 20% use a school computer at least once a week (Mumtaz 2001). A third study found that 78% of the 17–14 year-old young people who go online use the Web at least once a week (Rideout 2001).

Web access at school continues to grow. In 1994, 35% of public elementary schools had Web access, irrespective of school size, locale (urban, rural), minority enrollment, or reduced lunch status (U.S. Department of Education 2002). In 2001, it was 99%. Web access in the instructional room went from a mean of 3% in 1994 to a mean of 87% in 2001.

Much discussion about the “digital divide” exists because studies differ on, not whether a digital divide exists, but along what lines does it exist: ethnic, socioeconomic, and so on. Because school access seems widespread, most discussion centers upon home access. One reason is that, although schools provide Web access, it usually is limited by time and type of use (Mumtaz 2001).

Rideout (2001) found a digital divide based upon ethnicity and socioeconomic status: the groups least likely to gain access to the Web were the lower/working class (85%) and Hispanics (25%); and 55% of Hispanics had home Web access compared to 80% of whites.

Of all the on-line young people, Rideout (2001) found that 63% most often gain access to the Web at home, and 68% retrieve health information from the Web.

In two studies by Borzekowski and Rickert (2001a and 2001b) on New York children and young people and Web access, a mean of 92% of the respondents used the Web. No significant difference (no digital divide) in ethnicity was found. Although family income did have an impact, the studies suggest that the lower/working class manage to get Web access. Forty percent use the Web to obtain health information.

Another study substantiates a digital divide, showing lower-income blacks most affected (Brodie et al. 2000). Results showed that Web access at school tends to equalize access for children from different income levels. However, when Web access was gained, home use was similar across income, race, and age. Of those with Web access at home, 55% of adults and 19% of children looked up health information. Sixty-five percent of the children looked for information about diseases, 51% about ways to prevent illnesses, and 44% about diet and exercise.

The digital divide exists at home, mainly due to socioeconomics, but the divide is narrow or nonexistent at grade school. When the Web is available at home, both adults and children use it to seek health information.

Education Web

A survey of tenth-grade students found that most indicated that having health information available through the Web was worthwhile and valuable (Borzekowski and Rickert 2001b). The results suggest that Web publishers can alter the presentation of information to target young people, who can feel marginalized by restricted access to health information or by inquiry about sensitive health issues.

Peattie (2002) recommends that the Web be used to complement educational elements, not replace them. Hoffman et al. (2003), who measured the depth and accuracy of sixth-grade children's content understanding after their on-line research, argue that, although it is an information-rich environment, the Web alone does not help children's learning because they are novices at distinguishing between good and bad information. Most children in the study did not question the site's trustworthiness, but took the information at face value.

Web Site Standards

Manhattan Research surveyed 3,003 Web users to find out what they thought of the Web health landscape (Manhattan Research, LLC 2003). The responses regarding credibility, accuracy, and quality were almost evenly divided, positive and negative. Half said they struggle with discriminating which on-line health information is credible, and 65% said they see a need for improvement in accuracy, and 64%, in quality. Fox et al. (2000) concluded that, with more than 52 million adult Americans turning to the Web for health information (imagine the number if children were included), the landscape looks bright for health-related Web sites, but there is much room for improvement.

Shneiderman (1997) recommends that Web publishers begin site development by specifying the users and setting goals. Defining the audience should predicate the readability level, and setting goals should include application of quality standards. In a classic article, Silberg, Lundberg, and Musacchio (1997) wrote that those who apply quality standards "develop a respected brand identity, establish a level of trust with readers, and serve as a forum for the kind of informed, intelligent discourse that advances the scientific process and benefits the public health."

No studies reviewed discounted the need for quality standards for health-related Web sites. Studies recognized that the formation of and adherence to standards is evolutionary because of the evolving nature of the Web (Alexander and Tate 2003; Kim et al. 1999). The American Medical Association (AMA) and Health on the Net (HON) are two organizations that have become the standard-bearers for health-related Web sites.

Most standards require the site to identify authority, attribution, and currency, and to adhere to accuracy and objectivity (Berland et al. 2001; Gastel 2000; Alexander and Tate 2003; National Science Teachers Association 2001; Health on the Net Foundation 2003; Silberg, Lundberg, and Musaccio 1997). The AMA, for example, uses its standards to guide development and maintenance of AMA Web sites, and it allows other health-related Web sites to apply its standards when publishing reliable, high quality health and medical information (Winker et al. 2002).

Quality standards help to assess whether a Web site is communicating health information effectively. Failing to meet quality standards creates an environment ruled by confusion and unnecessary conflicts (Jadad and Gagliardi 1998).

Two studies on health sites geared for adults found that few sites had complete, unbiased information that was free from conflict (Berland et al. 2001; Sacchetti, Zvara, and Plante 1999).

Confusion reigned over enlightenment. The authors suggest that Web publishers focus on providing complete information, ensuring that information is accurate, free from conflict, and readable, written at a reading level fit for different socioeconomic backgrounds. In a similar study, Hellawell et al. (2000) found only a few Web sites that listed reference sources for the information provided, and nearly 40% of academic Web sites listed no reference sources.

Treise et al. (2003) found that the two most consistently documented dimensions of the credibility of an information source are trustworthiness and expertise. Credibility is an issue to adults; but, unfortunately, not much of an issue to children. Because children don't question enough the credibility of health-related Web sites, standards become even more important. In the Rideout (2001) study, of the 73% who said that knowing who produced the information is very important to them when looking up health information, only 29% checked the source the last time they did a search. Hoffman et al. (2003) found that certain children were quick to decide on the relevancy of sites based on the site's title or first page. The children considered all information on the sites good information.

Trust Factor

Izenberg and Lieberman (1998) propose that, since children tend to accept print, television, and the Web as authority, they should be taught evaluation skills and enough skepticism to look at Web sites critically, as they should all media. The authors called these skills "cyberliteracy."

Rideout (2001) found that 57% 15–24 year-old young people said that they would trust health information from the Web "a lot" or "somewhat," whereas 76% would put the same trust in television and 72%, in newspapers. Yet, Rideout found that a higher percentage (24%) said that they use the Web to get a lot of health information than those (17%) who trust the Web a lot. She concludes that although young people in the study were skeptical about the Web, they depended on it for information.

Another study asking the same question found that 62% of black children, compared with 37% of white children, said that they trust the Web "a little" or "not at all" (Brodie et al. 2000).

When investigating children who cybersurf for health information, Borzekowski and Rickert (2001a) found few who thought the Internet was unreliable.

A study by Treise et al. (2003) found that undergraduate students perceived science sites with a dot-gov domain as more credible than those with a dot-com domain, and sites by prestigious names (such as the National Air And Space Administration) more credible than generic sites. Sacchetti, Zvara, and Plante (1999) agreed, finding statistically significant higher quality information in the dot-edu and dot-org domains when compared with dot-com and dot-net domains.

Web users' level of engagement in the topic sought is connected to how stringently they critique a site. Those who are vigilant and concerned in the health topic are more selective and prone to check sources and currency than casual users, but the credibility judgment was the same for both user types (Treise et al. 2003).

Hoffman et al. (2003) found similar results from middle school children. Highly engaged children were more selective, thorough, and thoughtful when judging Web sites than their less-engaged counterparts. Less-engaged pupils often based their trust of a source on the domain, and critiqued a site based on its appearance rather than content. The authors partly attributed this to the novice learning skills of sixth-grade children.

Twenty percent of fifth-grade children in Hirsh's (1999) study mentioned Web site criteria related to authority or accuracy. Hirsh concludes that children do not tend to question the accuracy of the information on the Web, suggesting that they need to develop critical thinking skills and to learn to analyze and challenge the authority. Children in the study spent an average of 48 seconds a page reading Web content, which is similar to that reported by Nielsen//NetRatings (2003a).

Readability Factor

If a user doesn't comprehend what he or she is reading, the other qualities of the content are pointless. Several tests exist that measure the readability of text—how easy it is to read and understand. Rudolf Flesch developed a test that uses the average number of syllables per word and words per sentence to determine readability (Flesch 1979). The fewer syllables and words, the more readable is the text.

Two studies applied readability tests to Web sites written for adult audiences, and many other studies mention readability as integral to a quality site. No studies on readability were found that targeted youth-oriented sites.

Graber, Roller, and Kaeble (1999) investigated readability levels of patient education sites by applying the Flesch reading ease score and the Flesch-Kincaid reading level. The authors acknowledged that Web audiences' reading ability varies widely, generally below the school level completed. The results showed an average reading level of tenth grade, whereas previous studies indicate this to be higher than the majority of the audience.

Another study applied the Fry Readability Graph test to adult health-related sites. The average reading level was grade 13 (college level) and ranged from tenth grade to graduate school level. The authors conclude that, since 92 million U.S. adults had low or very low reading skills in 1992, most of the Web audience couldn't comprehend health-related content, regardless of its accuracy (Berland et al. 2001).

Jadad (1999) suggests that increasing health literacy on the Web results in children's understanding health facts and basic principles of decision making, which, once they become adults, may require little additional health education and less reinforcement of messages about health care.

Active or Passive Content

Educators favor active learning over passive learning; it is more effective. The same choice might apply to health information on the Web targeted to children—interactive over text/graphic content.

Stout, Villegas, and Kim (2001) investigated interactive elements on health-related Web sites and found that only a few commonly exist. Ten interactive elements were present in 60% of the sample. The most common were inter-site and intra-site links, e-mail, and a search engine. In less than half of the sites, surveys, quizzes, and games were played with the computer as the opponent. The authors attributed the sparse interactivity, compared to commercial sites, to the greater pressure on commercial sites to attract visitors. They admitted that entertainment entices users to stay longer and to visit the site more frequently, but not many health-related sites employ it.

Cassell, Jackson, and Cheuvront (1998) suggest that successful Web-based public health intervention requires interactive and imaginative design. They propose that the Web is a hybrid medium of interpersonal communication and mass media—excellent for persuasion.

Interactivity through graphics and positive feedback attracts the audience's attention and facilitates comprehension of the message. The authors conclude that attaining sophisticated interaction on a Web site is a challenge and may require multidisciplinary teams of expertise. However, these teams can employ designs and tools that ease navigation through much content, allow feedback and interactivity, and maintain links, creating a site that is clearly better than the others (Silberg, Lundberg, and Musacchio 1997).

Borzekowski and Rickert (2001a) recommend that Web publishers take advantage of its interactive nature. “Electronic pamphlets” will not entice children to look further into the site for health information, regardless of how engaged they are in the topic. The authors suggest targeting information more directly to children than to the general public. This can be done by providing same-age, real-life experiences, a message board, or other content that allows the children to connect to their own health needs by providing current, relevant, and realistic information.

What Children Want

Most children like reading about the experiences of their peers, females more than males. A survey of 15–24 year-old young people found that 92% of Web users send e-mail or instant messages, 89% look up information for school, 75% look up health information, 72% play games, and 67% participate in chat rooms or message boards (Rideout 2001). The health information most often sought is about diseases (50%), such as cancer and diabetes, sexual health (44%), and weight loss/gain (25%).

Mumtaz (2001) gathered data on how third- and fifth-grade children perceive and enjoy computer use at home and at school. At school, the children were exposed to small drill and practice programs, which they found time-consuming and boring. At home, they preferred to play computer games. Questionnaires in the study revealed that the children considered important the ability to choose an activity, control their time, and work by themselves. Mumtaz recommends that schools learn from what works at home, providing challenging and interesting programs in which the children can explore and feel in control. This may be the impetus needed for intellectual stimulation. This solution could apply to health-related Web sites, too.

Studies have shown that children prefer progressing by exploration, learning from their own mistakes. This way, they gain confidence to solve problems, and to develop thinking skills, patience, perseverance, memory, and imagination, which are at the heart of game-playing where feedback is immediate (Mumtaz 2001).

Hirsh (1999) interviewed, observed, and shadowed children as they searched and obtained information for an assigned topic. The activity was performed in the school library. Hirsh found that children relied heavily on the search result summaries to decide whether to visit a site and to save time. Some read only the first paragraph on a Web page to assess whether the site was worthy of further exploration. Hirsh related this method to skimming through the pages of a book to get an idea of the content. Observed preferences included convenient and easy access to pertinent information, interesting content, novelty of information, finding news interesting enough to present to their peers, and, finally, the quality or usefulness and currency of information.

Gould et al. (2002) found 20% of 15–18 year-old young people were dissatisfied with the help they received when looking on the Web for help with emotional health problems. The authors suggest that the dissatisfaction was because they used chat rooms as their primary source. Generally, chat rooms are free of supervision and allow unlimited misinformation.

National Public Radio, the Kaiser Family Foundation, and the Kennedy School of Government at Harvard (*NPR Online* 1999) surveyed by telephone 625 children, ages 10 to 17, including an oversample[†] of African Americans. Of the 17% who said they use the Web to get health information, 65% look for information about diseases, and 51% look for information about ways to prevent illness. Interestingly, when asked if certain technologies made life better for Americans, the children rated computers highest (91%), and then the Internet (Web) (80%), cellular phones (65%), and television (35%).

[†] An oversample is a sampling procedure that gives a certain set in the overall population a larger representation than it actually has.

Mostly, today's generation is growing up with televisions and computers at home and at school. Not only are they accustomed to the visual and interactive characteristics of these media, but they are impatient when the quality is low. Expectations are high. Competition for young people's attention is fierce. Educational and informative Web sites provide a different experience than the heavily promoted movie-, television-, and toy-related sites (Shields and Behrman 2000).

Izenberg and Lieberman (1998) found that entertainment, personal connections, and empowerment are three major reasons children enjoy the Web. These would also be reasons that children would enjoy health-related Web sites, if the sites provided them. The authors point out that health topics arise in many youth-oriented Web sites, but very few sites focus mainly on health. Instead, they focus on one topic, such as nutrition on Dole 5 a Day (www.dole5aday.com) (DiSorga and Glanz 2000) or chronic illness on Band-Aids & Blackboards (www.faculty.fairfield.edu/fleitas/contents.html). The success of these sites is shown by the number of links to them on other sites and the positive visitor feedback.

Hong and Cody (2002) investigated pro-tobacco messages on the Web and conclude that young people are a major portion of traffic on sites with a recreational and hobby component, including those featuring popular actors, musicians, and television shows. Interactive features encouraged the young people to explore the site, enhancing its appeal.

Changing Health Behavior

Pro-tobacco Web sites try to appeal to children and young people by using popular hype. Possibly, health-related Web sites could do the same, but, instead, persuade the children and young people to change bad health behaviors for good ones.

One study of adults suggests that a Web site can change behavior. This study (Oenema, Brug, and Lechner 2001) investigated the impact of a Web-based tailored nutrition education program on adult behavior, using an intervention group versus a control group. After viewing the program, those in the intervention group had greater awareness of fat, fruit, and vegetable intake levels, and greater intention to change to healthier diets. The intervention group rated the program more personally relevant than the control group rated their paper-based information (a hand-out).

The tailored Web-based program established authority and attribution. It presented a questionnaire, and then it gave feedback based on the answers given, integrated text with color and graphics. It summarized information and ended with motivating messages of change.

Peattie (2002) conducted focus groups with adults and teenagers, separately, discussing sun safety as prevention from skin cancer and if the Web might be used to promote sun safety. The focus groups talked about common sun safety myths, which cause conflict and confusion. One example mentioned was the lifeguards' "safe" tan on the television drama *Baywatch*. The adult focus groups said it is a challenge convincing teenagers that they need to practice sun safety. They proposed that intervention through the Web was a solution. The teenagers generally agreed that they and their peers were not well-informed on sun safety and needed facts; but, that if the facts were presented at school, they might not be taken seriously. Recommendations made by the teenagers for presenting sun safety on the Web included an article featuring a celebrity, a chance to win a prize, or a discussion group in which young people could exchange personal experiences. They recommend avoiding a read-only site because that would be too boring.

At least some health-related sites already seem to be making a difference in the lives of children and young people. In Rideout's (2001) survey, 15–24 year-old young people were asked if information on the Web caused them to change a behavior. Thirty-nine percent answered yes; 69% said that they had talked with friends about health information they saw on-line; and 73% of respondents said that it is important, on a Web site, to be able to ask specific questions, to find the information easily, and to hear different sides of an issue.

In their theoretical rationale for using the Internet to persuade the public to improve health behavior, Cassell, Jackson, and Cheuvront (1998) reason that the immediate and interactive nature of the Web provides for powerful worldwide health communication and intervention. Its mass media characteristic can be used to create awareness and persuade health-promoting behaviors albeit in a personal, individualistic way. The authors give three suggestions on how to persuade through the message: (1) motivate the audience to accept and interpret the content, (2) include ways for the audience to interact and provide feedback, and (3) engage the audience in arguments and counter-arguments that help move individuals through an attitude change. The content, then, allows people to persuade themselves. If this rationale is applied to youth-oriented Web sites, the design might call for challenging interactive games or puzzles to inspire thinking through arguments and counter-arguments, and an immediate feedback method.

Interactivity through the Web can be used to translate knowledge into action, allowing the user to practice a behavior change in a safe environment, preparing for a real change, and leading to a higher success rate of change (Stout, Villegas, and Kim 2001).

A case study was conducted of sixth-grade children's progress through a Kids as Global Scientists (KGS) program to see if on-line communication motivated children to learn science. The study found that when children thought using the Web, especially for collaboration with a professional, was engaging, feelings of self-efficacy increased, which leads to greater persistence and enthusiasm for science (Mistler-Jackson and Songer 2000).

Summary

It is no news flash that the World Wide Web is a mass yet personal and influential medium. The amount of ongoing research on how to use it to effectively communicate health to the public or to a target audience demonstrates that improvement in this untamed medium is desired. As an information or news medium, or as an educational tool, the Web reaches across socioeconomic, geographic, and other boundaries to allow communication and interactivity to occur on an individual level. The Web publisher bears the responsibility to publish sites according to quality standards and integrity. The Web user bears the responsibility to know the difference between good and bad sites and to look for those differences. As health-related Web sites compete with other sites and each other to gain an audience, important design issues must be addressed with the audience in mind, such as whether to use interactive elements, which ones, and how many. Children are attracted to certain Web features and certain health topics. A children-oriented, health-related Web site must plug into those attractions to convey its message and persuade a health behavior change.

Research Objectives

This present study investigated whether a children-oriented, health-related Web site effectively communicated its message to its targeted audience of fourth- through eighth-grade children. The objective of the Veggie-mon.org site was to teach children about nutrition, and sun safety, and other topics related to cancer research and prevention. The site had five branches: Nutrition, Sun and UV, Laboratory, Ask a Scientist, and Glossary (see Figure 1).

The former three branches had sub-branches. Nutrition had Nutrition, Food Pyramid, and Kids' Cuisine. Sun and UV had UV Did you Know, Bacteria Blues, and Informative Fish. Laboratory had Oxidation Experiment and UV Experiment. The site visitors were introduced to Veggie-mon, Sun Spot and Strawberry Girl, who guided them to science-based, health-related information, experiments, recipes, a quiz, e-mail exchange with a cancer researcher, and a glossary. A collaborative effort between experienced teachers and cancer research staff and scientists, the site was sponsored by the University of Texas M.D. Anderson Cancer Center and the Community Outreach and Education Program of the Center for Research on Environmental Disease. The goal was to communicate and teach environmental science and to encourage healthy lifestyle choices to children, especially those in rural or financially disadvantaged school systems.

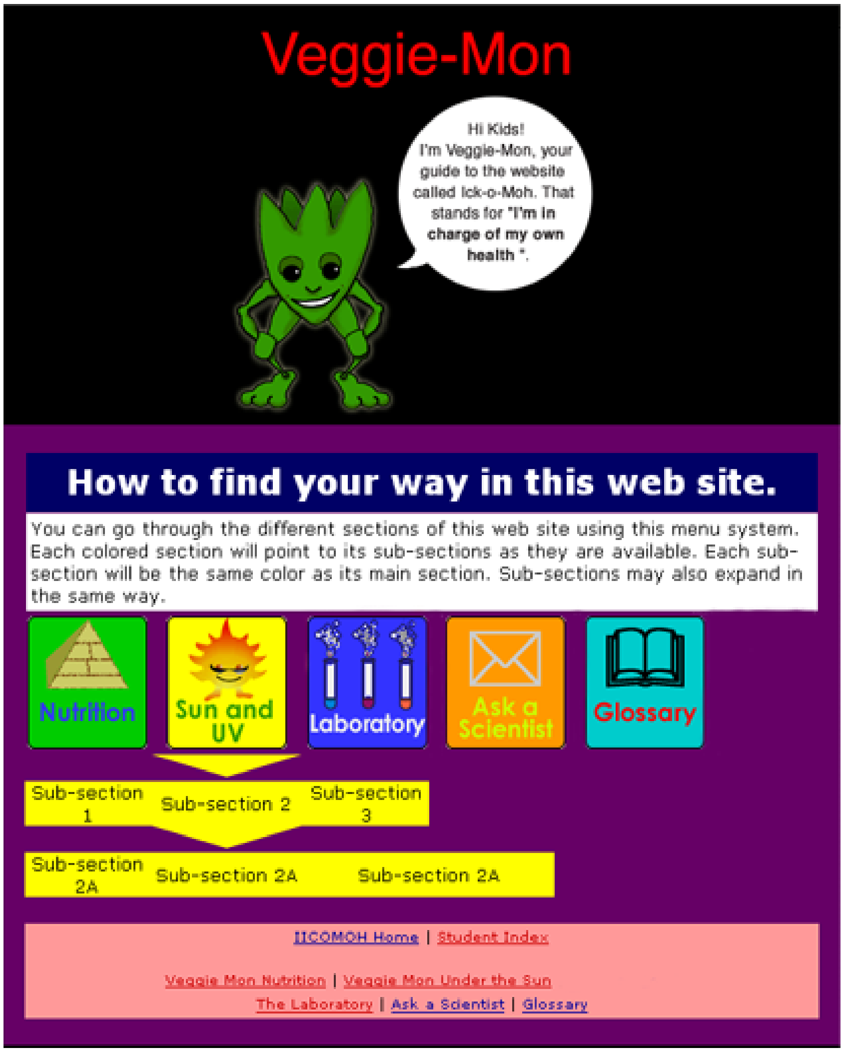

Figure 1: Opening Veggie-mon.org Web Page for Children, Grades Four Through Eight

This research aims to answer these questions:

Does frequency of Web access affect the audience's receipt of the message?

Does the Web site effectively communicate a health-related message to its targeted audience?

Does the Web site teach its audience new health information, or does it confirm previously known health information, or both?

Are the Web site's readability scores consistent with the levels of its targeted audience?

Is the audience attracted to the Web site's elements, such as text, graphics, and interactive tools?

Does the Web site persuade its audience to consider a health behavior change?

METHODS

This study used selected methods from several studies. For example, Borzekowski and Rickert (2001a and 2001b) gathered data from a sample with similar characteristics using a survey to find adolescents' use and attitudes toward accessing health information on the Web. Like these studies, this one reports percentages for Web use and perceptions to determine whether differences exist between groups, and statistical software was used to assist with analysis. No report was found of a study that investigated one particular health-related Web site for elementary and middle school children, and that employed focus group sessions of the site's target audience (children in grades four through eight). This study is unique because of the particular Web site targeted (Veggie-mon.org) and the methods employed, namely pre-perusal and post-perusal interviews, observation, and focus group discussions.

Human Subject Approval

The Community Outreach and Education Program (COEP) of the Center for Research on Environmental Disease (CRED), and a science and technology journalism graduate student at Texas A&M University, worked together to develop focus group sessions. The CRED is part of the University of Texas M.D. Anderson Cancer Center, Science Park, Research Division.

Because this study involved focus group sessions involving children (human subjects), Institutional Review Board (IRB) approval was required. Both the Texas A&M University IRB and the University of Texas M.D. Anderson Cancer Center's Office of Protocol Research approved the study and required that parental consent be obtained from all participants.

Participants

Three schools were asked to participate in the study. Smithville Elementary School and Del Valle Junior High agreed to participate, but the third school declined.

Smithville Elementary, grades four through six, in the rural town of Smithville, is 42 miles southeast of Austin. In 2001–2002, the school had 418 enrolled pupils: white 71%, Hispanic 17%, African American 11.5%, and other 0.4%, of whom 45.7% were economically disadvantaged, as defined by the state of Texas. Smithville Elementary earned an academically acceptable rating from the Texas Education Agency in 2002.

Del Valle Junior High, grades seven and eight, in the suburban town of Del Valle, is seven miles southeast of Austin. In 2001–2002, the school had 1,006 enrolled pupils: white 19%, Hispanic 63%, African American 16%, and other 2%, of whom 69.9% were economically disadvantaged. Del Valle Junior High earned an academically acceptable rating from the Texas Education Agency in 2002.

The sample was 65 children, whose ages were within the range targeted by the Web site (ages nine to 14), with the exception of two 15-year-old participants. The sample primarily represented suburban-Hispanic and rural-white South Texas children. Both schools have nearly half or more economically disadvantaged children. This variable might indicate whether the digital divide caused by socioeconomics has an effect on the participants' receiving the Web site message.

Preparation

The schools were told that the study's aim was to educate the children and to find out whether the Veggie-mon.org Web site was communicating environmental health information effectively to its targeted audience. An added benefit was to build a good working relationship between the participating schools and the University of Texas M.D. Anderson Cancer Center, Science Park, Research Division, which interacts with the nearby communities, pupils, and teachers. The schools were reassured that IRB approval required adherence to strict guidelines regarding data collection.

An estimated 171 parental consent forms were sent home with children several days before the focus group sessions were scheduled. Only children who returned a signed consent form were allowed to participate (n=65). The return rate was an estimated 38% (65/171).

Focus Group Sessions

All focus group sessions were held in a reserved computer lab at the respective school. Participants rotated from the classroom to Internet-accessible computer stations in the computer lab and to a focus group discussion group and then returned to the classroom. An observer remained at each station throughout the sessions. Eight observers participated: one volunteer, one graduate student from Texas A&M University, and six who work for University of Texas M.D. Anderson Cancer Center, Science Park, Research Division.

As a participant sat at a computer station, an observer introduced himself or herself and read aloud a final consent to which the participant had to decline or to agree. Participants who declined were allowed to return to the classroom. Participants who agreed marked only the date, which the observer initialed and dated. All participants remained anonymous.

The observer conducted a pre-perusal (of the Web site) interview, documenting the participant's responses. Pre-perusal questions were designed to capture demographics and the experience level of the participant in relation to the Web and select environmental health topics.

After the pre-perusal interview, the observer told the participant to (1) look at the Web site already showing in the browser; (2) look at the site freely, any way the participant wanted; and (3) take as much time as he or she wanted, up to 20 minutes.

During the perusal, the observer observed and made notes. The observer did not instruct the participant. Notes included: perceived adeptness of the pupil at site navigation, perusal time, the chronological order of pages visited, and observed responses and comments spoken by the participant.

Beginning at the Web site home page, the participant freely perused until ready to quit or time expired (20 minutes). After the participant finished perusing the site, the observer conducted a post-perusal interview. Post-perusal questions were designed to assess whether the participant gained knowledge during the perusal.

After the post-perusal interview, participants moved to the focus group where the leader, an employee of the CRED, asked questions to elicit discussion on what the participants thought about the Web site and how it affected them. Before beginning the discussion, the leader told the participants to provide honest responses and assured them that no consequences would result from their positive or negative responses. Time of the focus group discussion varied depending on the number of participants and length of discussion. After the focus group discussion ceased, the participants returned to the classroom.

At the end of the day, each observer completed a survey to assess the success of the tools and the format.

Readability Tests

The readability levels in the Web site were sought using Microsoft® Word 97. A Flesch Reading Ease test and a Flesch-Kincaid Readability test were performed— a study method modified from Graber, Roller, and Kaeble (1999). A researcher used copy and paste features to copy the text from the Web site and paste them into Word. Then, the researcher performed the tests by applying Word's spelling and grammar check to the passages. Seven passages in the Web site were tested: three passages from Nutrition, three passages from Sun and UV, and one from Laboratory. The readability test results appear when the spelling and grammar check are finished.

Quantitative and Qualitative Measurements

Quantitative and qualitative data were collected by means of participant interviews, observation notes, focus group discussions, and readability tests. Interview and focus group responses, and observation notes, were quantified based on numbered categories. Measures of central tendency, such as median and mean, were calculated using Microsoft® Excel, Microsoft® Word, and calculators. Statistical comparisons (one- and two-tailed tests, chi-square tests) were performed using SPSS® software, a statistical analysis package for the social sciences. During perusal observation, time measurements and the number of hits per Web site page were measured.

Quantitative Data. A researcher coded the pre-perusal and post-perusal interview responses, observers' notes, and focus group responses noted by the leader when entering the data into Microsoft® Excel. Most data were quantified into numbered categories. For example, responses to the interview question, "Who is Veggie-mon?" were coded into categories: (0) no answer, (1) health-related, Web-related vegetable, (2) other, and (3) don't know. Researchers consider category (1) to be the correct answer.

SPSS® software was used to submit the coded data to statistical tests to find statistically significant differences. For example, the right, wrong, and "don't know" responses to the pre-perusal interview question, "What are the foods at the top of the [food] pyramid?" were cross-tabulated with the right, wrong, and "don't know" responses to the post-perusal interview question, "What are the foods at the bottom of the [food] pyramid?" A chi-square result was calculated, and a probability value of 0.05 ($p<0.05$) was considered statistically significant.

The remaining data were already quantified (Likert scale), to measure relative intensity, or considered qualitative data (descriptions of the Web site). An example of a Likert scale question is, “How often have you used the Internet to look up information about health?”: (1) every day, (2) at least once a week, (3) at least once a month, (4) not very often, and (5) never.

Because of the small sample number, some data, such as number of participants in age groups and number of page visits, were calculated by counting occurrences noted on the interview and observation forms.

Qualitative Data. The interviews, observations, and group discussions produced qualitative data—significant comments made by participants and observers. For example, the focus group leader asked participants to describe what they liked and disliked most about the Web site, and observers were allowed to comment on observed body language, the method of a participant’s perusal, the attitudes exhibited by the participant, and so on. Qualitative patterns were sought such as which gender or grade level read thoroughly or jumped between pages without reading, and which looked at most of the site or at only a few pages.

Limitations

Potential sources of error exist from “I don’t know” responses and no answers (either because the participants didn’t give an answer or because the observer or focus group leader didn’t prompt one). These were coded as one category in this study.

Because it is possible that only pupils who were comfortable with the Web turned in parental consent forms, all participants showed Web adeptness.

Socioeconomic level was not a demographic datum collected from the participants because they were too young to know it. No comparisons could be made between socioeconomic levels.

Random sampling was not possible because of the low number of returned parental consent forms (n=65). Reasons for the low turn-out could be that pupils neglected to present the forms to parents, that signed forms were forgotten at home on the day of the sessions, that the forms were lost, or that parents or pupils were disinterested or dissenting. Responses from all participants are reported in this paper.

RESULTS

Part 1: Focus Group Sessions

Demographics. The children who returned a signed parental consent and who initialed a personal consent were included in the study (n = 65). Fifty-seven percent (37/65) were white, 25% (16/65) were Hispanic, 9% (6/65) were African American, and 9% (6/65) were of mixed and unknown ethnicity. Girls were in the majority at 60% (39/65): at Smithville, 56% (27/48) and at Del Valle, 71% (12/17). No significant differences existed between schools and gender (χ^2=1.075, df=1, p=0.3).

Fifth-grade children (34%, 22/65) were the majority, which is why most participants were 11 years old. Fourth-grade children were 21% (14/65) of the participants, and sixth- and seventh-grade children, 18% (12/65). The 12% (5/65) of eighth-graders were all Hispanic. Overall, 74% (48/65) of the participants were from Smithville Elementary and 26% (17/65) were from Del Valle Junior High (see Table 2).

TABLE 2
Sample Characteristics

	Girls						*Boys*					
		Ethnicity						*Ethnicity*				
Grade	*n*[a]	*W*[b]	*H*	*A*	*M*	*U*	*n*	*W*	*H*	*A*	*M*	*U*
4th	9	6	1			2	5	3	1	1		
5th	14	11	3				8	8				
6th	4	2	2				8	5	1	1	1	
7th	8		3	3	2		4	2		1	1	
8th	4		4				1		1			
Totals	39	19	13	3	2	2	26	18	3	3	2	0

[a]n = number of participants
[b]W = white; H = Hispanic; A = African American; M = mixed; U = unknown

Computer Use and Web Access. Sixty-seven percent (43/64) of the participants said they have Web access at home, 69% (33/48) from Smithville and 59% (10/17) from Del Valle. (One participant did not respond.) These percentages coincide with Borzekowski and Rickert (2001a), who reported 52% (75/145) of their sample (13–21 years old) used the Web at home. This study found that 73% (27/37) of whites and 62.5% (10/16) of Hispanics had Web access at home, a smaller margin that found in the Rideout (2001) study: 80% of whites and 55% of Hispanics. (Rideout provided only percentages and a total sample of n=1209.) There was no significant differences between home Web access and the schools (χ^2=3.074, df=2, p=0.2) and between home Web access and gender (χ^2=1.370, df=2, p=0.5).

Forty-six percent (30/65) of the participants in this study said that they used the Web at least once a week (see Table 3). This is lower than the 61% (381/625) reported by Brodie et al. (2000), the 78% reported by Rideout (2001), and the 62% (61/145), and 65% (156/319) reported by Borzekowski and Rickert (2001a and 2001b). Of those weekly users in this study, half were female and 25% (16/65) were observed to be familiar with navigation techniques. Six percent (4/65) had never used the Internet: 75% (3/4) were fourth-graders and 25% (1/4) was a fifth-grader, 75% (3/4) were white, and 25% (1/4) was an African-American. Six percent (4/65) had used the Web daily: half (2/4) were seventh-graders, 25% (1/4) was a fifth-grader, 25% (1/4) was a sixth-grader, and each was of a different ethnicity: white, Hispanic, African-American, and mixed. Twenty-nine percent (19/65) said they used the Internet "not often," and 12% (8/65), monthly. In this study, no significant differences existed between frequency of Web use and gender (χ^2=1.054, df=4, p=0.9).

TABLE 3
The Web: the Sample's Frequency of Use by Gender and Ethnicity

	Girls						Boys					
		Ethnicity						Ethnicity				
Frequency	*n*[a]	*W*[b]	*H*	*A*	*M*	*U*	*n*	*W*	*H*	*A*	*M*	*U*
Daily	2	1	1				2			1	1	
Weekly	17	12	4	1			13	11	1		1	
Monthly	5	2	2		1		3	2	1			
Not Often	13	2	6	2	1	2	6	4	1	1		
Never	2	2					2	1		1		
Totals	39	19	13	3	2	2	26	18	3	3	2	0

[a]n = number of participants in the sample
[b]W = white; H = Hispanic; A = African American; M = mixed; U = unknown

Girls (36%, 14/39) use the Web mostly for searches, 18% (7/39) for e-mail. Most boys play games (35%, 9/26), and search (27%, 7/26). Seven participants didn't respond. No significant differences existed between type of Web use and gender (χ^2=5.840, df=6, p=0.4).

Most participants (72%, 47/65) have looked up health information on the Web, although 49% (32/65) said "not often." This compares to the 75% found in the Rideout (2001) study, and the 42% (61/145) and 49% (156/319), respectively, in the Borzekowski and Rickert (2001a and 2001b) studies.

Time Spent Looking at Which Pages. No stringent time limits were put on the participants while they perused Veggie-mon.org Web site. They were told that they could look at the site for up to 20 minutes. Few had to be told time was up.

Which of the five branches in the Web site that participants visited first, second, and third was documented. The first branch most visited was Sun and UV (38%, 25/65), then Laboratory (28%, 18/65) and Nutrition (26%, 17/65). No one visited Glossary first.

The second branch most visited was, again, Sun and UV (31%, 20/65), and then Nutrition and the Glossary at 22% (14/65) each. The third branch most visited was the Laboratory (29%, 19/65), and then Nutrition (23%, 15/65), and Sun and UV (19%, 12/65). Ask a Scientist and Glossary tied at 11% (7/65).

Overall, Sun and UV attracted the most attention, Nutrition and Laboratory attracted the same medium level of attention, and Ask the Scientist attracted the least.

The number of visits (or "hits") that sub-branches and pages received was documented. The Food Pyramid sub-branch received the most hits (192), and the Bacteria Blues sub-branch received 171 hits (see Figure 2). This could be because these sub-branches sit directly under an arrow from the branch on the menu (see Appendix A). The two Laboratory experiments and Ask a Scientist were viewed almost equally. The Glossary received many hits because of links from other categories.

Total hits recorded for branches were Nutrition 43% (593), Sun and UV 32% (443), Laboratory 15% (206), Glossary 6% (86), and Ask a Scientist at 4% (53).

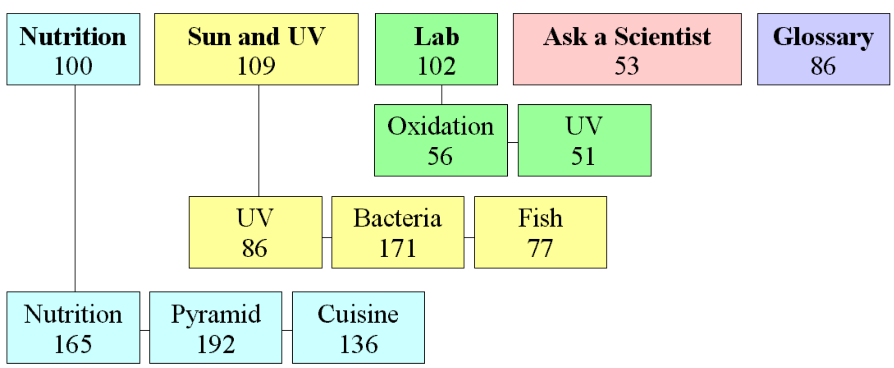

Figure 2: Number of Visits to Veggie-mon.org Branches and Sub-branches

Pre-perusal and Post-perusal Interviews. Seven questions about facts on the Web site were asked during the pre-perusal interview and again during the post-perusal interview.

"Who is Veggie-mon?" This question was intended to find if participants saw the obvious, since the Web address includes the Veggie-mon character's name; he introduces himself on the home page, and he appears prominently on other pages. Responses that depicted Veggie-mon as health- or food-related and Web-related were considered desirable (correct). During the pre-perusal interview, 11% (7/65) gave a correct response (see Table 4). During the post-perusal interview, 72% (47/65) gave a correct response. Sixty-one percent (40/65) discovered Veggie-mon, a statistically significant improvement (χ^2=35.145, df=12, p<0.001).

"Is it healthy to get a dark suntan?" This question tested the participants' belief in the myth that a dark suntan is not harmful to the skin. Ninety-four percent (61/65) answered correctly ("no") in both interviews, indicating that the participants had previous knowledge of this. Four participants answered "don't know" every time, except for one "yes" in the post-perusal interview. In the post-perusal interview, "Is it healthy to get a sunburn?" was answered 100% correctly (no). The chi-square value was invalid because the number of responses in the interviews was high and similar.

TABLE 4
Interview Questions and Percentage of Desired Responses

Interview Questions and Desired Responses	*Desired Pre-perusal Responses (%)*	*Desired Post-perusal Responses (%)*
Who is Veggie-mon? (Web-related, health-related)	11	72
Is it healthy to get a dark suntan? (no)	94	94
Are there things in the environment that can cause illness? (UV rays/sunlight)	3	17
What illnesses can be caused by things in the environment? (cancer)	12	26
Do you know what the food pyramid is? (yes)	91	97
What foods are at the top/bottom of the food pyramid? (fats and sweets/ breads and cereals)	48	80
How much of these foods should you eat each day? (a little or the least of all/6–11 servings or the most of all)	31	34

"Are there things in the environment that can cause illness? Can you name one?" The Web site addressed the harmful effects of sunlight and ultraviolet (UV) rays. Many of the participants who did not know or had no answer (37%, 24/65) before looking at the Web site still did not know the answer (32%, 21/65) afterward. In the pre-perusal interview, 18% (12/65) said pollutants or air caused illness, but that answer dropped to 6% (4/65) in the post-perusal interview. In the pre-perusal interview, 3% (2/65) said the sun or UV rays cause illness, and then that answer rose to 17% (11/65) afterward. The results showed an improvement in obtaining an answer and an improvement in obtaining the desired answer. Chi-square values were not obtained.

"What illness can be caused by things in the environment?" The Web site addressed the cause of skin cancer. Participants' responses given before they looked at the Web site showed that 48% (31/65) did not know the answer or had no answer. After looking at the Web site, 45% (29/65) did not know the answer or had no answer. In the pre-perusal interview, 12% (8/65) said "cancer," and then that answer more than doubled (26%, 17/65) afterward. The results showed an improvement in obtaining an answer and an improvement in obtaining the desired answer. Chi-square values were not obtained.

"Do you know what the food pyramid is?" This question identified if the participants had prior knowledge of the food pyramid. In the pre-perusal interview, 91% (59/65) said that they knew what the food pyramid was. In the post-perusal interview, 97% (63/65) said that they knew what the food pyramid was, a statistically significant difference (χ^2=38.175, df=2, $p<0.001$). Two seventh-graders answered no to this question in both interviews: one spent seven minutes perusing the Web site and did visit the food pyramid sub-branch, and the other did not visit the food pyramid sub-branch.

"What foods are at the top of the food pyramid?" This question was asked only in the pre-perusal interview. "What foods are at the bottom of the food pyramid?" This question was asked in the post-perusal interview. The change of the word "top" to "bottom" caused the participants to have to think about the entire food pyramid. The food pyramid was shown as a graphic on which participants could click for text that provides more information on each food category. In the pre-perusal interview, 48% (31/65) knew the foods at the top of the pyramid. In the post-perusal interview, 80% knew the foods at the bottom of the pyramid—a statistically significant difference (χ^2=39.926, df=24, p=0.022).

No statistically significant difference exists between the top of the food pyramid and the bottom of the food pyramid questions and gender (χ^2=3.529, df=2, p=0.17 and χ^2=0.242, df=2, p=0.89, respectively).

A statistically significant difference exists between the question about the top of the pyramid (asked before they saw the Web site) and home Web access (χ^2=9.810, df=2, p=0.17). No significant difference exists between the question about the bottom of the pyramid (asked after they saw the Web site) and home Web access (χ^2=0.711, df=2, p=0.70). Most of those with home Web access seemed to think they knew the answers to these questions (provided answers, instead of answering "I don't' know") after looking at the Web site, but got it wrong (13 to 2).

"How much of these foods should you eat each day?" The response to this question depends on the response to the previous question, "What food is at the top/bottom of the food pyramid?" The participant had to read the text for that food to find out recommended daily servings; it was not on the food pyramid graphic. In the pre-perusal interview, 31% (20/65) correctly said the recommended daily servings for fats and sweets, the top of the pyramid. In the post-perusal interview, 34% (22/65) correctly said the recommended daily servings for breads and cereals, the bottom of the pyramid. The chi-square value was invalid because the responses were high and similar. Six participants who did not know the answer or had no answer in the pre-perusal interview gave an answer in the post-perusal interview. This result shows an improvement in correct answers and an improvement in answers attempted.

Focus Groups. Twenty focus group discussions occurred—13 at Smithville Elementary and 7 at Del Valle Junior High. On average, each focus group had three participants. The discussions occurred frequently with small numbers to facilitate moving the participants through the sessions as quickly as possible to minimize disruption to their class time. Percentages given below are loosely tabulated based on the number of times a comment was made by participants, and noted by the group leader, divided by the 20 focus group sessions that occurred in total (frequency the comment occurred/20). The leader noted responses only; the leader did not indicate respondents' characteristics or how many participants gave the same response. Responses potentially might be biased because the focus group leader was associated with the owner of the Web site, University of Texas M.D. Anderson Cancer Center. Researchers countered this potential bias by emphasizing to participants before discussions began that their honest responses were desired and no consequences would result from them.

The focus group leader asked questions to elicit whether the children considered quality standards such as authority, accuracy, and currency. Regarding authority, 55% (11/20) knew that "scientists" or "M.D. Anderson" provided the information on the Veggie-mon.org Web site, and 11% (2/20) said, "Veggie-mon" (see Table 5). Regarding accuracy and currency, 95% (19/20) said they believed that the information on the Web site is "correct," and 85% (17/20) said they feel it is current. Participants were distributed evenly on the reasons they felt the information was accurate, including "it's by scientists," "a lot of research has been done," "I've heard it before," and it "sounds" or "feels" accurate. Similarly, reasons for currency were evenly distributed. Some said the site was current because the graphics appeared to be current, and because they had "read" or "heard" similar information recently.

TABLE 5
Focus Group Discussion Questions and Most Frequent Responses

Focus Group Discussion Questions	*Most Frequent Responses*	*(%)*
Who provided the information on this Web site?	scientists/ M.D. Anderson	55
Do you feel the information is correct?	yes	95
Do you feel the information is current or up-to-date?	yes	85
How much on the Web site did you not understand?	a little	45
How interesting is the Web site?	a lot	35
Which do you remember most, information or pictures?	information	50
How much did you like the pictures?	pretty much	40
What did you like best about the site?	the information	35
What did you like least about the site?	pictures	60
What did you learn?	cancer	50
Does it [what you learned] make a difference to you?	yes	60
Would you look at this Web site on your own?	yes	65
Is this a Web site you would tell a friend about?	yes	75

To shed some light on the site's readability and clarity, the participants were asked how much they did *not* understand. Using a Likert scale of "a lot" to "none at all," 45% (9/20) said "a little." One participant selected "not at all."

Much discussion time was spent on the participants' preferences about Veggie-mon.org Web site. Using a Likert Scale, they rated how interesting they found the site. Thirty-five (7/20) percent selected "a lot," and 20% (4/20) said "pretty much." One participant selected "not at all."

The participants were evenly divided on which they liked better, the information or the graphics, such as the Veggie-mon and Strawberry Girl cartoon-like characters. Forty percent (8/20) liked the graphics "pretty much." The two parts of the sites that the participants liked best was the overall information (35%, 7/20) and the recipes in the Nutrition branch (20%, 4/20). The UV game quiz was mentioned only once. When asked what they liked least about the site, half said a particular branch or sub-branch name, predominantly the UV game quiz and the graphics.

Some mentioned the glossary and that the site had too many words. One comment was that there were not enough fun games, and another mentioned the Ask a Scientist branch.

The leader asked the focus groups to give adjectives that would describe the site. Most frequently given adjectives were "interesting," "informative," "educational," "fun," and "colorful." Negative adjectives given were "boring," "immature," "needs games" and "wordy."

An objective of this study was to investigate whether the site affected the visitors' decision-making about their own health care. When asked, "What did you learn?" more than half spoke about cancer, particularly in relation to UV rays and skin damage. Just less than half spoke about nutrition. Forty-five (9/20) percent said that they would use what they learned to protect themselves from the sun and to eat better, and 60% (12/20) said that what they learned would make a difference to them. Only one said that it would not. Sixty-five percent (13/20) of participants said that they would look at the site on their own, and 75% (15/20) said that they would tell a friend about it.

Part 2: Readability Tests

This part of the study is adapted from a similar study on readability of Web sites by Graber, Roller, and Kaeble (1999). In this study, a researcher copied text from several pages, from different branches, of the Web site to the computer clipboard by clicking the right mouse button and choosing "Copy" from the pop-up menu. Then, the researcher opened a blank document in Microsoft® Word 97, and, from the Edit drop-down menu, selected "Paste." The pasted copy was cleaned up to contain only body text.

The text was submitted to a spelling and grammar check (on Word's Tools menu), which results in a Flesch reading ease score and Flesch-Kincaid reading level, if the option is set to do so.

The Flesch Reading Ease Score represents readability based on a score (see Table 6). Four steps in a formula result in a score. Multiply the average sentence length (number of words/number of sentences) by 1.015. Multiply the average word length (number of syllables/number of words) by 84.6. Add the two products. Subtract the sum from 206.835. The result is the readability score. The score range is 0 to 100, from nearly unreadable to very easy.

TABLE 6
Flesch Readability Scale

Score	*School Level*
90 to 100	5th grade
80 to 90	6th grade
70 to 80	7th grade
60 to 70	8th and 9th grades
50 to 60	High school
30 to 50	College
0 to 30	College graduate

Source: Flesch (1979)

The Flesch-Kincaid Index represents readability based on grade level. To get the result, multiply the average sentence length by 0.39. Multiply the average word length by 11.8. Add the two products, and then subtract the sum from 15.59. The result represents the grade level at which the text can be read. For example, a result of 5.2 means a pupil in the fifth grade for two months can adequately read the text.

Microsoft® Word will do both of these readability tests automatically. It provides additional information such as percentage of sentences written in passive voice, number of words, and average sentences per paragraph. This study looked at passive voice percentage, average sentence length, Flesch Reading Ease scores, and Flesch-Kincaid Grade Levels. Microsoft® Word did not provide the average word length.

First, three passages from Nutrition were tested: Water, Carbohydrates, and Proteins. The passages explained how the topic related to a balanced diet (see Table 7). Water (6.3) rated nearly two grade levels below Carbohydrates (7.8) and Proteins (7.7). Proteins (13.8) had a higher average sentence length, and Carbohydrates (5.1) had a higher average word length. Although Proteins had the highest percentage of passive voice (46%) of all the pages tested, its average sentence length (13.8) was the median, and its Flesch Reading Ease (64) and Flesch-Kincaid Grade Level (7.7) was closest to the median of all the other pages.

TABLE 7
Readability Tests on Text in Veggie-mon.org Web Site

Text Passage	*Percent Passive*	*Average Sentence Length*	*Flesch Reading Ease*	*Flesch-Kincaid Grade Level*
Water	10	13.0	72.3	6.3
Carbohydrates	16	10.7	58.2	7.8
Proteins	46	13.8	64.0	7.7
Texas	37	21.6	52.8	11.2
Journey to Antarctica	20	14.4	73.5	6.5
Palmer Station	17	12.1	76.7	5.5
Oxidation Experiment	0	12.3	72.2	6.2

Second, three passages from Sun and UV, Bacteria Blues, were tested: Texas, Journey to Antarctica, and Palmer Station. In these passages, a scientist tells about her experience collecting bacteria in Antarctica and measuring DNA damage caused by sunlight. A wide range in grade levels was seen, from 5.5 for Palmer Station to 11.2 for Texas. Clearly, the average sentence length was a factor between Palmer Station (12.1) and Texas (21.6), a 9.5 difference. In fact, Texas' average sentence length (21.6) was the highest of all passages tested.

Third, the text of an oxidation experiment in Laboratory was tested. At a Flesch-Kincaid grade level of 6.2 and a Flesch Reading Ease score of 72.2, the oxidation experiment was near median for all pages tested, except that it contained no passive voice.

The implications of these test results are that the text throughout the Web site needs to be written at a consistent reading ease and grade level, the lowest grade level targeted. Reducing average word length and average sentence length could increase readability. Reducing the passive voice in a sentence could reduce the number of words.

CONCLUSIONS

The purpose of this study was to assess a particular Web site, Veggie-mon.org, by observing a portion of the targeted audience, children in grades four through eight, perusing the site, by asking questions about topics addressed on the site, and by allowing students to provide feedback in focus group discussions. Although the study's limitations hindered meaningful conclusions, the research is indicative of expected results. The study is a success to the researchers because it found that the site effectively communicated to its audience and it found areas of improvement needed.

Part 1: Focus Group Sessions

Limitations. Important limitations are the sample size and characteristics, a Web site perusal time limit, and the recognition by the participants that the researchers were associated with the Web site.

The sample size (n=65) was too low for results to be compared to large populations. This study's methods applied to a larger sample would require a large team of researchers, which were not available for this study. This study doubled as a pilot study to obtain experience and mechanics for a larger study using the same or similar methods: interviews, individual observation, and focus group discussions. These methods done on a larger scale would require a larger team of researchers than was available for this study.

Demographics. The sample was within the age and grade range targeted by the Veggie-mon.org site, with the exception of two 15-year-old eighth-graders. Because most (57%, 37/65) participants were younger than the mode age targeted (12 years old), results (except for readability tests) reflect lower maturity, education, and reading levels. The sample was mostly rural white and suburban Hispanics, which does not statistically represent the targeted audience.

Computer Use and Web Access. Participants are similar to those in other studies regarding whether they have home Web access, how frequently they use the Web, and how frequently they use the Web to look up health information. The results in this study were compared mostly to the Brodie et al. (2000), Borzekowski and Rickert (2001a and 2001b), and Rideout (2001) studies because they asked questions in their surveys that were similar to those asked in this study.

Hispanics in this study lagged behind the whites on Web access at home. This agrees with findings in the Rideout (2001), Becker (2000) and the U.S. Department of Education (2003) studies. They attribute the lag to socioeconomics, which was not considered in this study. Further research is needed on the socioeconomic effect on whether children receive the message in health-related Web sites and whether socioeconomics make a difference in feelings of comfort or status, reading levels, and topics viewed.

From the literature review for this study, researchers concluded that the digital divide is closing because of the increasing availability of Web access to homes, schools, and public venues. As the digital divide closes, the need is greater to develop Web sites that are understandable and readable to the lowest educational level of the targeted audience. Web publishers could state on the site who is the targeted audience to help users recognize the site's level. The Veggie-mon.org site does this, the entry point states: "Students Grades 4-8 Click Here."

Most, but not the majority, (46%, 30/65) of participants said that they use the Web on a weekly basis. "At least once a week" was the most reported frequency in the studies. However, this study's percentage was lower, possibly because the age range in this study is younger (9–15 years old) than those studies reviewed: 15–17 years old by Rideout (2001), 13–21 years old by Borzekowski and Rickert (2001a), a mean of 15.8 years old (Borzekowski and Rickert (2001b), and 10–17 years old by Brodie et al. (2000). In this study, four participants who had never used the Web were in the lowest grade, fourth.

The percentage of participants who have looked up health information on the Web (72%) was lower than the Rideout (2001) study (75%), but only by 3%. The age range differences (9–15 years old vs. ages 15–24 years old) might be the reason this study was lower—younger children. However, this study's percentage was higher than three other studies, so age may not be a factor. A similar age difference is seen when compared with both Borzekowski and Rickert (2001a and 2001b) studies, 42% and 49% and ages 13–21 and a mean age of 15.8, respectively. Brodie et al. (2000) had the lowest percentage: 20% of ages 10–17 years old.

Time Spent Looking at Which Pages. When the participants began perusing the Veggie-mon.org Web site, the branch visited first most frequently was Sun and UV, probably because it was the only branch which had its sub-menus displayed on the opening page or because it is the brightest-colored graphic (yellow) among the branches. Sun and UV's opening page received only a few more hits (at least seven more) than Nutrition and Laboratory opening pages. However, the opening page hits do not reflect which sub-branch pages received the most hits. Nutrition's sub-branches received 159 more hits than Sun and UV sub-branches. Food Pyramid received the most hits (192), possibly because three questions in the pre-perusal interview were about the food pyramid. This would make it convenient to visit the other two sub-branches while under Nutrition. Links to Glossary in other branches account for many of the hits it received.

Researchers expected a higher number of visits to Ask a Scientist because of its interactive characteristic. Users can e-mail a scientist at the University of Texas M.D. Anderson Cancer Center. At least five students were observed attempting to send an e-mail, but the school's system security would not allow e-mail to be sent or received. Ask a Scientist was rendered useless in these schools which incorporate some type of e-mail restriction.

This study concludes that interactivity on a site, like the e-mail in Ask a Scientist and the UV-ray quiz in Sun and UV does not automatically make it likeable or more interesting to children. Some participants who tried the quiz became frustrated when their feedback was consistently “Sorry” for an incorrect answer. Interactivity is an immense challenge for Web publishers because of the effort it takes to include it on a site. Interactive elements are more complex than text and graphics. Interactivity that is persuasive is an even greater challenge.

Pre-perusal and Post-perusal Interviews. To find out if the Veggie-mon.org Web site effectively communicated its message to its audience, researchers asked pre-perusal and post-perusal questions about topics addressed on the site and compared the responses. Two of the seven questions (“Is it healthy to get a dark suntan?” and “Do you know what the food pyramid is?”) produced fruitless results because both pre-perusal and post-perusal responses were so similar. Researchers compared the percentages of correct (11% pre-perusal and 72% post-perusal) and incorrect (89% pre-perusal and 28% post-perusal) responses to the question, “Who is Veggie-mon?” (χ^2=54.97, df=1, and p<0.001). This shows that the participants learned who is Veggie-mon.

Ninety-one percent (59/65) of the participants knew about the food pyramid and 94% (61/65) knew that dark suntans were unhealthy before the focus group sessions. Perhaps the results would have been more meaningful if the desired answers to the questions were beyond the basic information and, instead, found further into the text. This result indicate that the objective of these questions should be more detailed and in-depth.

Focus Groups. The majority of participants said that they considered the Veggie-mon.org site accurate (95%, 19/20) and current (85%, 17/20), but 45% (9/20) did not answer correctly who provided the information on the site. The reasons given for their confidence were not based on a set of standards. This finding agrees with findings in other studies (Hirsh 1999, Izenberg and Lieberman 1998, Hoffman et al. 2003, and Treise et al. 2003). Users will rely on quick visual cues, such as the Web address domain (dot-com versus dot-org), to decide whether a site has authority and is accurate and current (Hoffman et al. 2003 and Treise et al. 2003).

This study concludes that children need to be taught by adults how to apply quality standards and a healthy level of skepticism to a Web site and to combine the information with other sources and media.

An important limitation in this study is that participants knew that the researchers were associated with developing or sponsoring the site. The parental consent form stated that the Web site was developed and maintained by University of Texas M.D. Anderson Cancer Center, who now wanted the participants to look and it and give their opinion. This limitation implies that their responses may have been affected, especially about the authority of the site. A participant could assume that only credible authorities would go to the trouble of assessing the site. Twice in the focus group discussion, participants associated "scientists" with University of Texas M.D. Anderson Cancer Center.

Although most participants said that the site was correct and current, 45% (9/20) understood the site "a little." At least 40% (8/20) had confidence in a Web site that they understood "a little." This problem emphasizes the naivete of children and the need for adults to help children become more skeptical of Web sites (Izenberg and Lieberman 1998). It suggests that Web developers need to submit their sites to usability tests by the targeted audience to ensure that the message so trusted is understood. One area on which to concentrate to help the audience understand is readability.

The most frequent response to "How interesting is the Web site?" was "a lot." The participants said that they remember the information on the site the most, although they liked the pictures "pretty much." However, 60% (12/20) said what they liked least about the site were the pictures. The creators of the Veggie-mon character tried to appeal to the children's interest through Veggie-mon's likeness to the popular television and game character, Pokemon, and through his association with health—nutrition—because he is a vegetable. Focus group comments showed that the participants, especially the older ones, were not impressed. Perhaps the popularity of Pokemon has dropped and dragged down Veggie-mon with it.

Impressive are the results that 50% (10/20) of participants said that they learned about cancer, 60% (12/20) said that it makes a difference to them, 65% (13/20) would look at the site again on their own, and 75% (15/20) said that they would tell a friend about the Web site. The 14% increase in the answering correctly the question, "What illnesses can be caused by things in the environment," and 51% who said they learned about cancer supports this study's conclusion that participants did receive a message from the Veggie-mon.org Web site, a message about cancer. Focus groups discussions showed that some of the Veggie-mon.org audience was persuaded to consider eating healthier and doing more to protect their skin from harmful UV rays.

Part 2: Readability Tests

The results of the readability tests indicate that the Veggie.mon.org Web site is written at a level too high for most of its targeted audience. The site has good company. The reading levels of most health-related Web sites are too high for the general public and too high for targeted audiences (Berland et al. 2001, Graber, Roller, and Kaeble 1999).

This study concludes that Web site readability affects the receipt of the message by the audience. It affects whether the user gets the right message or leaves the site with a misunderstanding, which might lead to poor decision-making. When the reading level is too high for the them, Web site visitors skim the content, evaluate the content based on appearance or domain or on another weak criterion rather than on accuracy. They remain casual about the content rather than investing themselves, and they don't return for another visit.

Because the Web makes sites accessible around the world, Web developers and Web writers face an enormous task making the message understandable to such a vast, unknown audience. Targeting a specific audience helps, but the task continues to be a challenge, as shown by this study. More research should be done on the readability levels of health-related Web sites, particularly for children who take into adulthood the health-related messages that they receive from Web sites.

Flesch (1979) said that shorter sentences and shorter words reduce the amount of information the brain has to store before the thought is complete. His recommendation to help complex text is to shorten the sentence lengths. For example, make one long sentence into two or three, or turn subordinate clauses into independent clauses, and replace complex words with shorts ones, beginning with words with prefixes and suffixes.

The success of this study lies in the numbers that show that the participants knew more about the topics after having seen the Web site. The audience becomes more engaged as it grows familiar with the Web site, so the trick is getting the audience to return.

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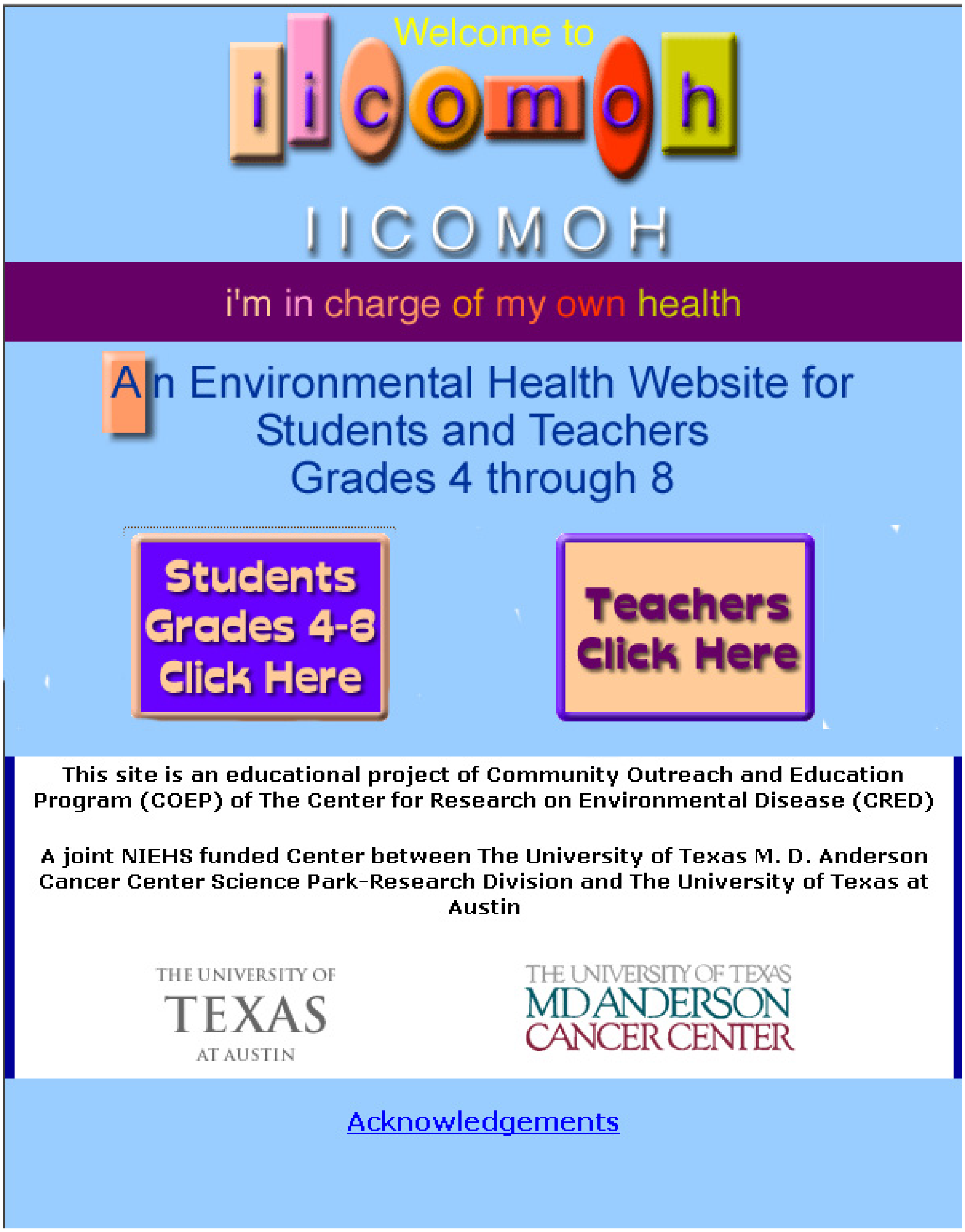
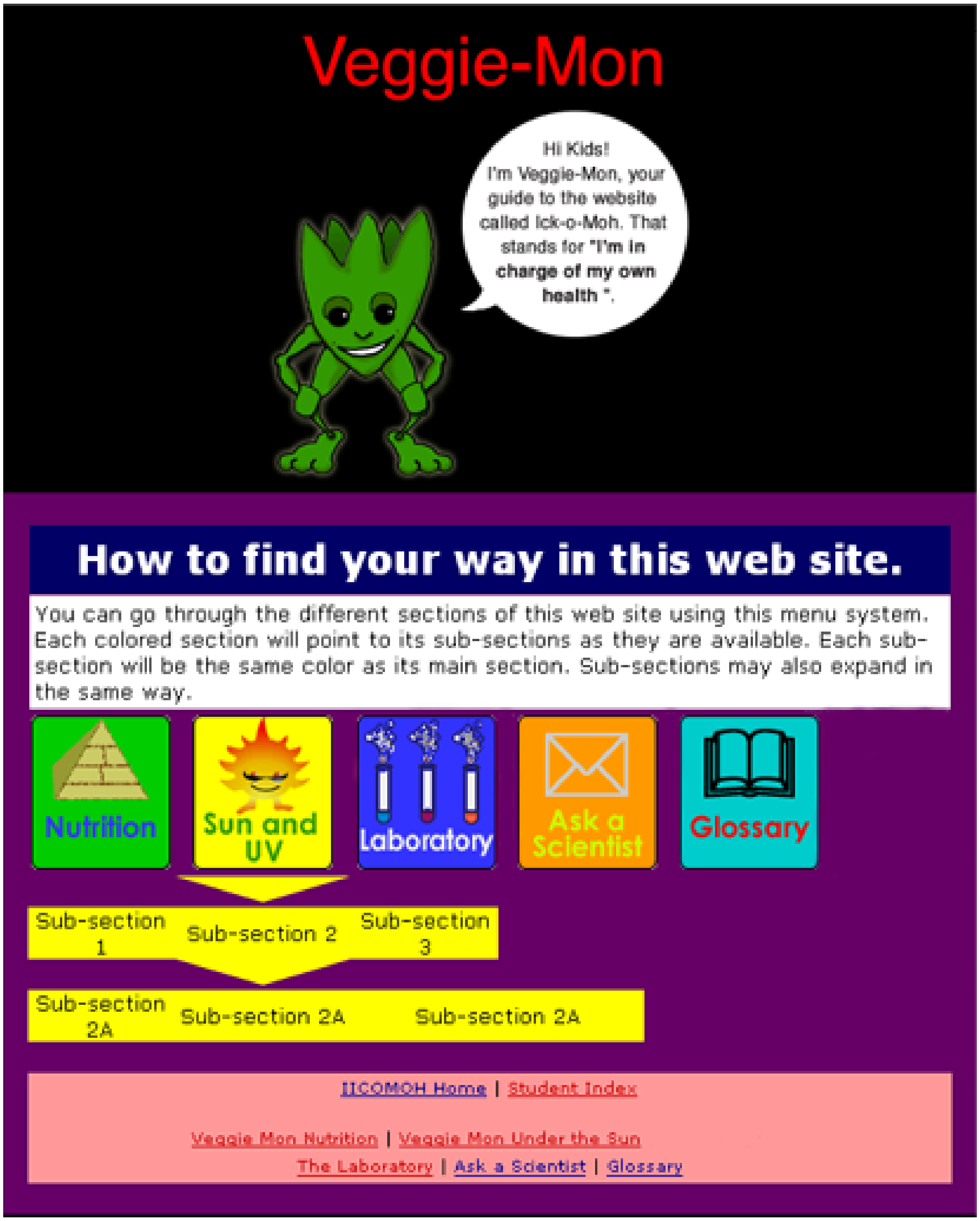
APPENDIX A

Pages from the Veggie-mon.org Web Site

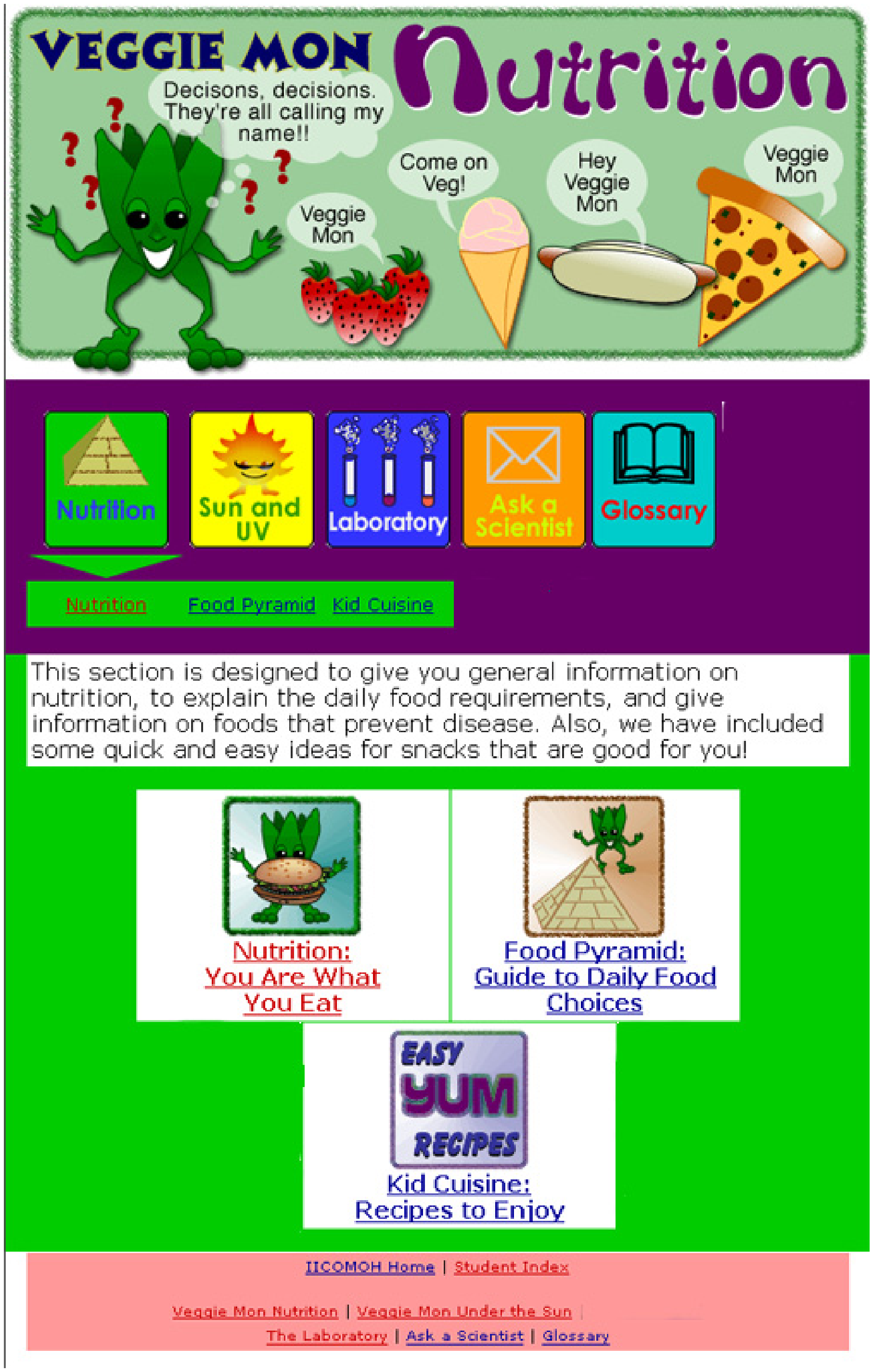
Opening page to Veggie/mon.org



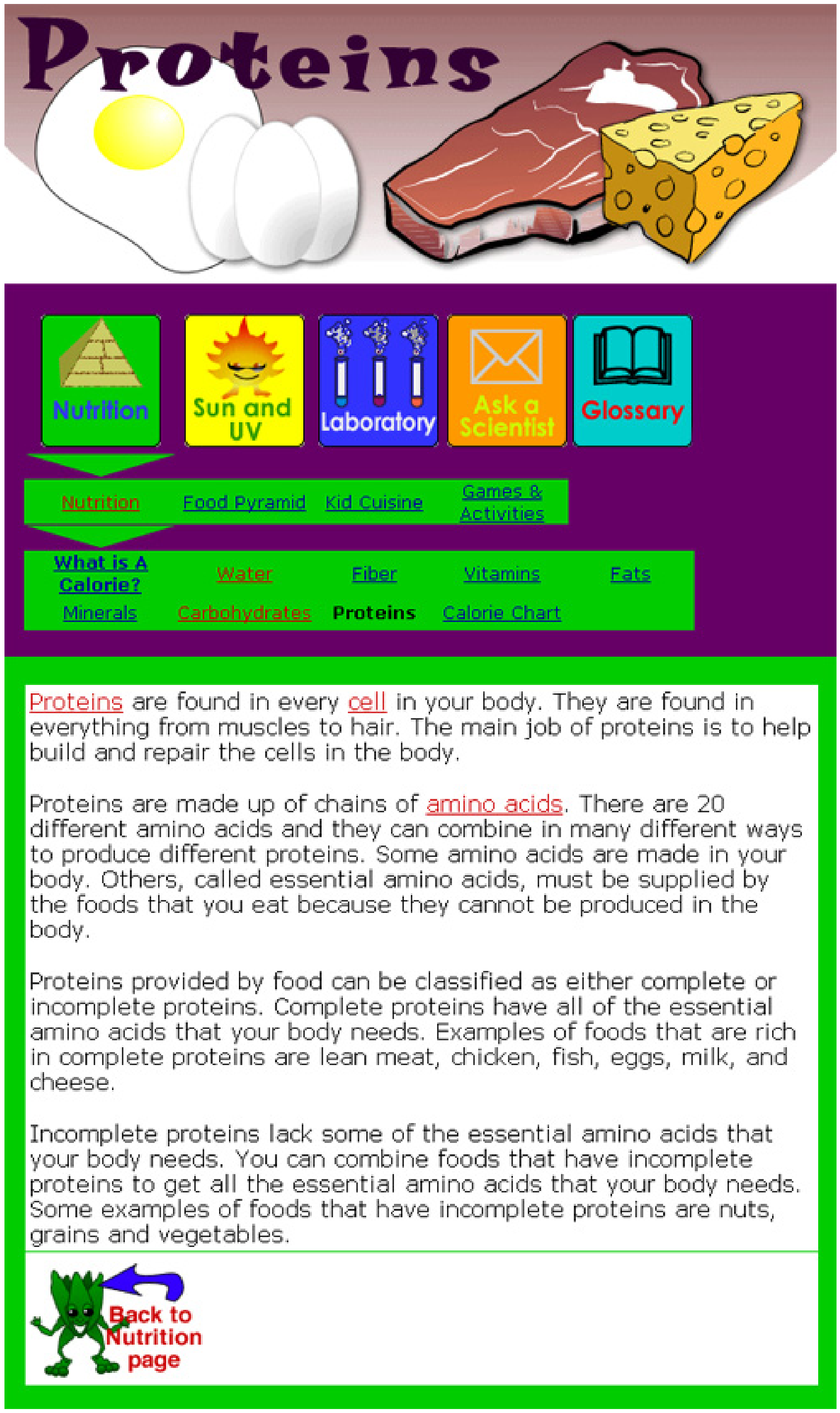
Opening pages for branch for Grades 4-8



Nutrition Branch



Nutrition: Proteins



Proteins are found in every cell in your body. They are found in everything from muscles to hair. The main job of proteins is to help build and repair the cells in the body.

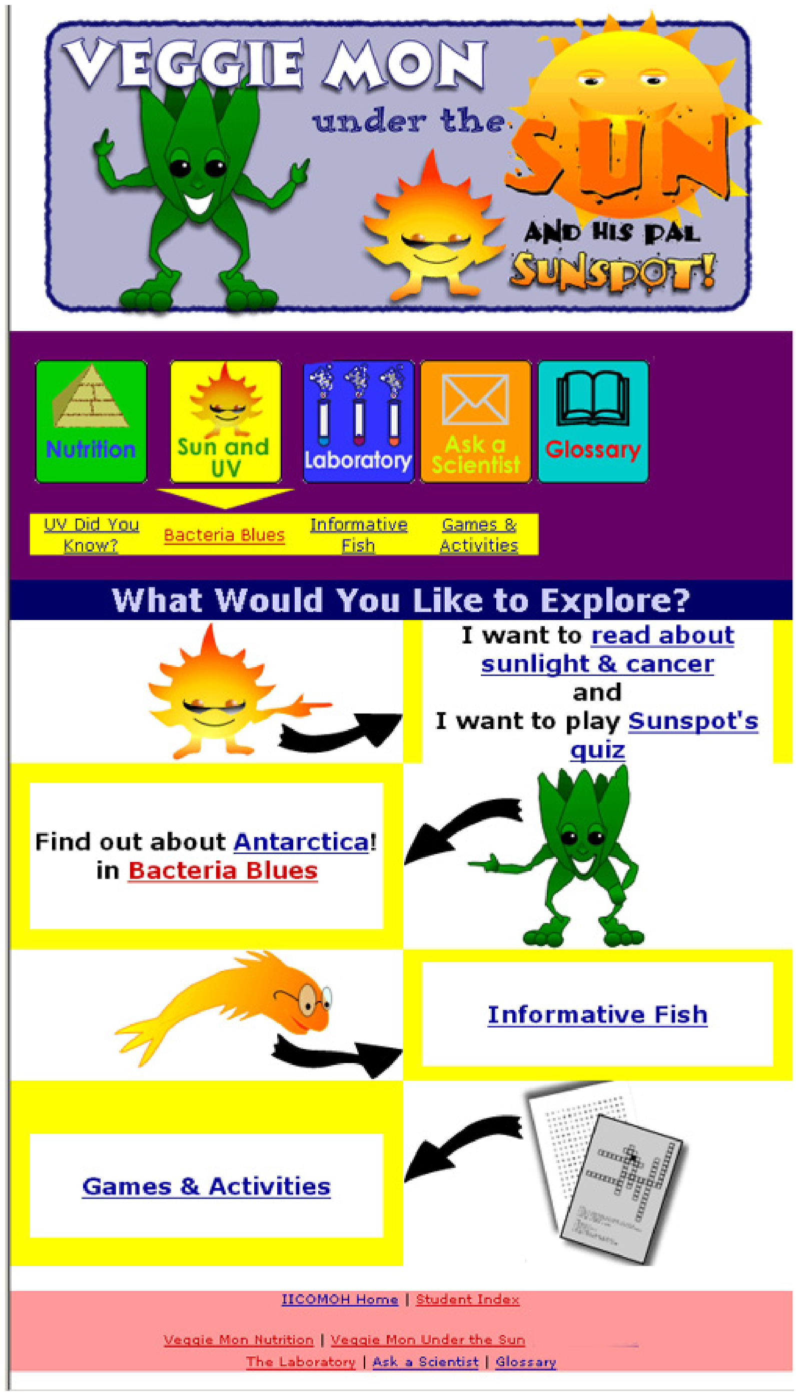
Proteins are made up of chains of amino acids. There are 20 different amino acids and they can combine in many different ways to produce different proteins. Some amino acids are made in your body. Others, called essential amino acids, must be supplied by the foods that you eat because they cannot be produced in the body.

Proteins provided by food can be classified as either complete or incomplete proteins. Complete proteins have all of the essential amino acids that your body needs. Examples of foods that are rich in complete proteins are lean meat, chicken, fish, eggs, milk, and cheese.

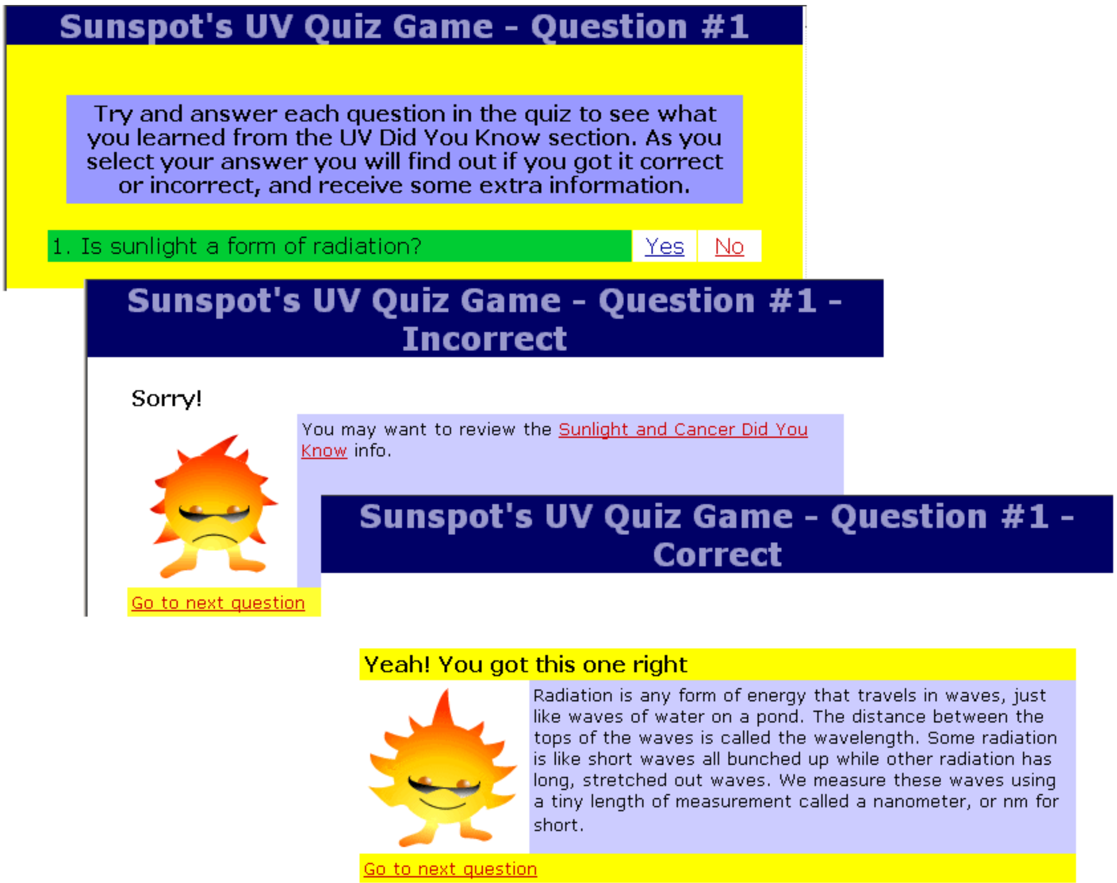
Incomplete proteins lack some of the essential amino acids that your body needs. You can combine foods that have incomplete proteins to get all the essential amino acids that your body needs. Some examples of foods that have incomplete proteins are nuts, grains and vegetables.

Back to Nutrition page

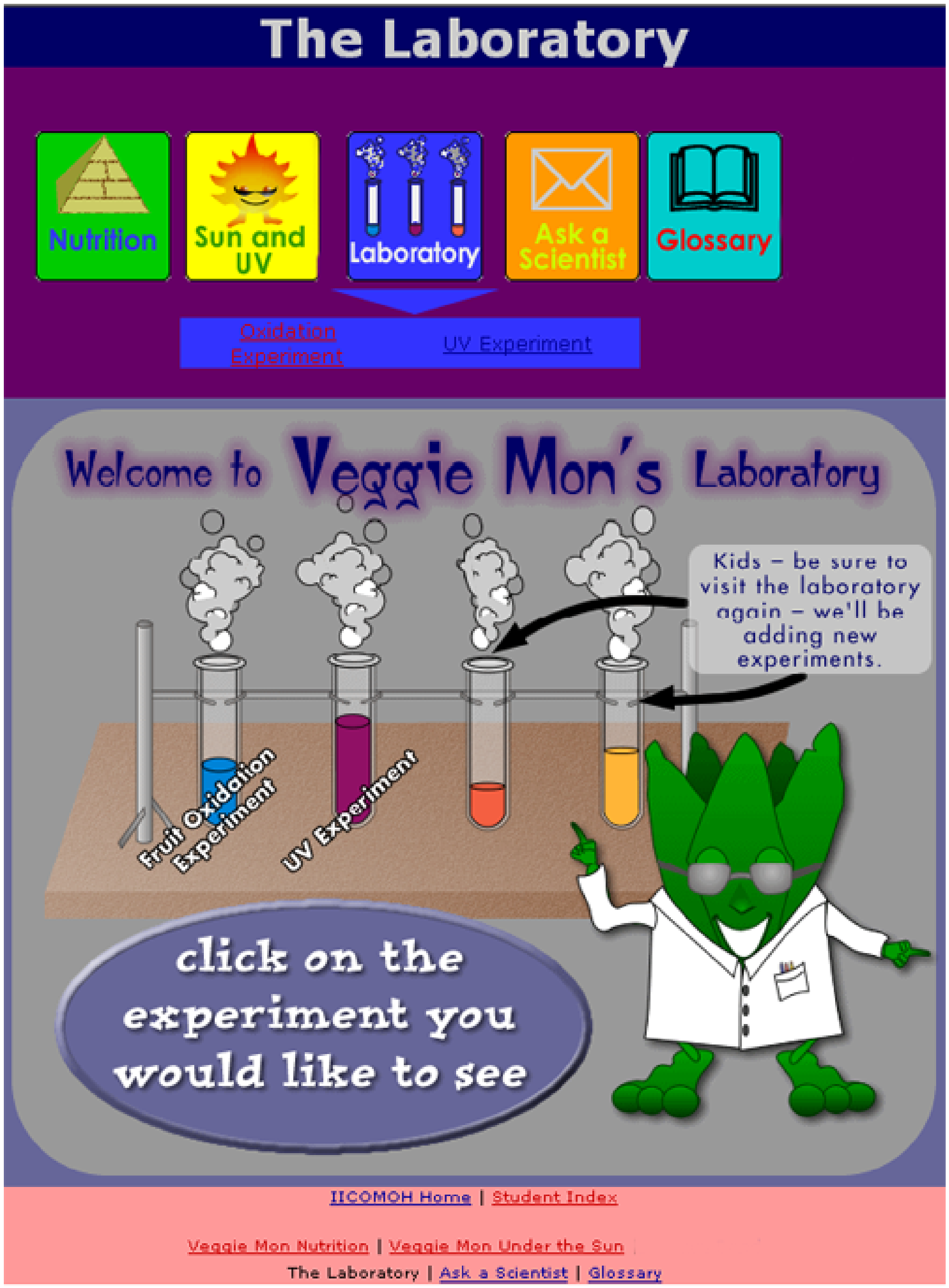
Sun and UV Branch



Sun and UV: Sunspot's UV Quiz Game



Laboratory Branch



Laboratory: Oxidation Experiment

Do you ever wonder what health experts mean when they say fresh fruits and vegetables can protect your health?

It is all based on OXYGEN! (O_2 is the chemical formula for the gas).

You see oxygen can both help and hurt living things. It helps by providing a key chemical that allows our bodies to process nutrients. It can also hurt and cause damage when it participates in oxidation reactions.

Oxidation is a process that causes damage to cells in a way that is similar to the reactions that cause iron to rust.

What happens to iron and some kinds of steel when they are left open to air and moisture? They rust and corrode (oxidize).

Certain foods have the ability to protect cells from some of the damage caused by oxygen. These foods contain chemicals or agents called "antioxidants" such as vitamins A, C and E.

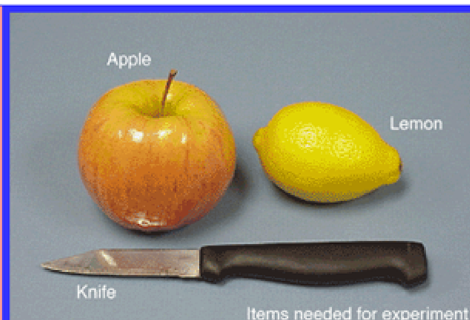
Other antioxidants include: Blueberries (most concentrated anti-oxidant source), oranges, broccoli, carrots, watermelon, cabbage, apples, spinach, and tomatoes.

Lemons contain vitamin C that inhibits oxidation of apple slices.

Use this simple experiment to show the damage (oxidation) that can take place and how lemon juice can have an effect.

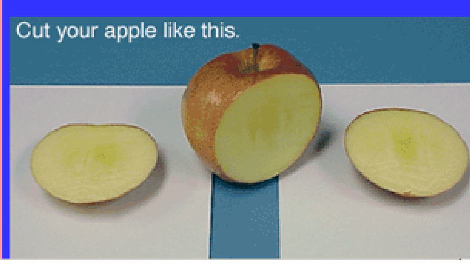
You will need the materials shown: an apple, a lemon, and a knife. You will also need two paper plates or two sections of paper towel laid out flat.

Be sure and ask an adult to assist when you slice the apple and lemon.



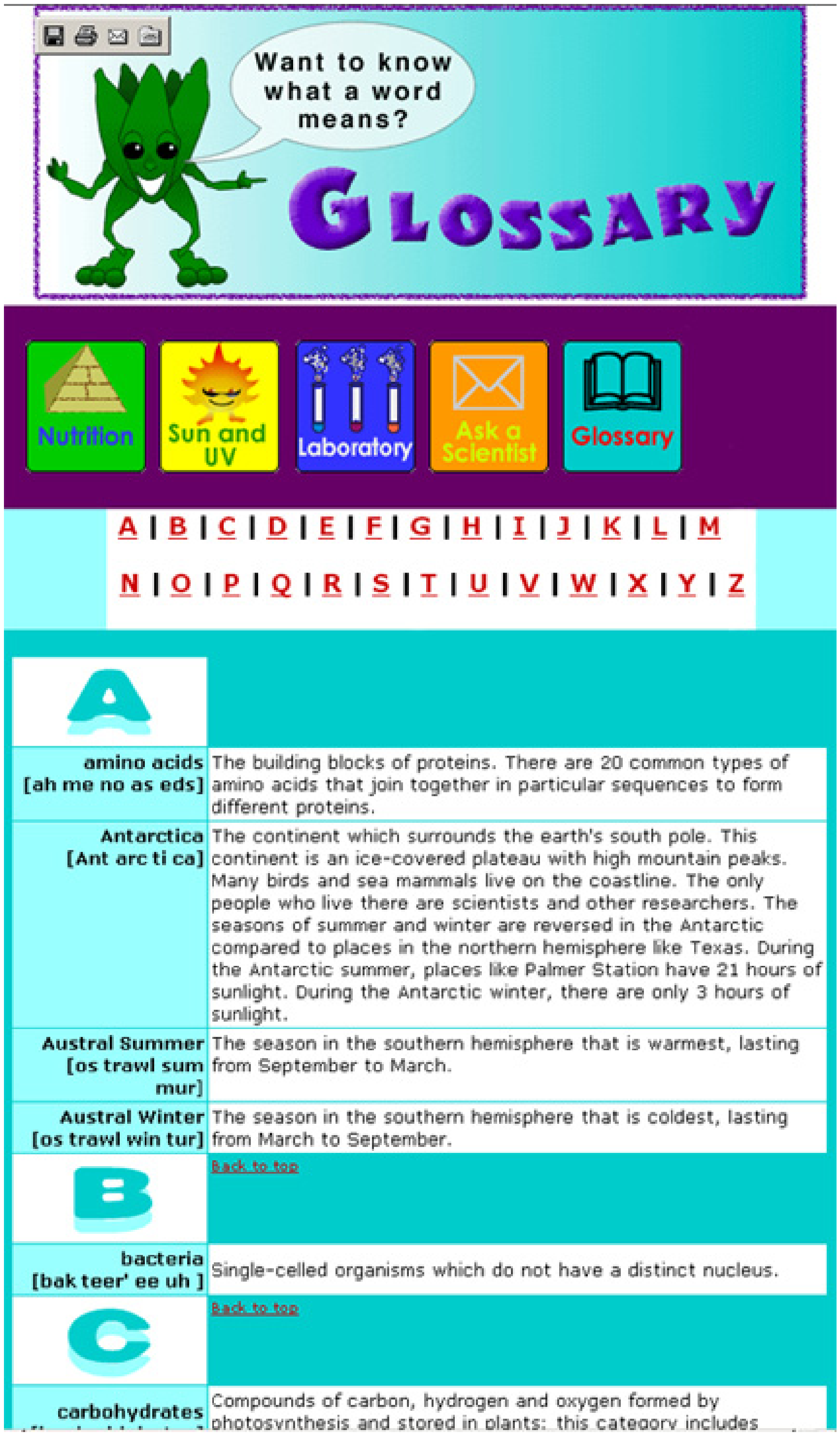
Items needed for experiment

- Make two shallow apple slices by cutting vertically along the axis of the stem. Look at the picture below to see what your apple cut should look like.
- Put the apple slices peel side down on your paper plates or towel sections.



Ask a Scientist Brach

Glossary Branch



APPENDIX B

Forms

Letter to Teachers

Note for Classroom Teachers Whose Classes are Participating in the Veggie-Mon Review Process

We would like to leave it to teacher discretion how the forms are sent home to parents. We will be ready to begin the focus group sessions as soon as the teachers have a few forms returned.

This package contains background about the veggie-mon focus groups for students grades 4^{th} – 7^{th}. :

- A color print out and description of the Veggie-mon site. (which may be copied if
- needed in black and white)
- 30 copies of the parental consent forms (additional copies may be made)
- A copy of the student consent form (for your information purposes only)
- A copy of the data sheet used by the observer (for your background only)

The way that we see this being organized is that a teacher will permit 5 or so students (4^{th} –7^{th} grade) at a time to come to the computer room. Each student will be paired with an observer and will go through the procedures in the education research protocol. We request that teachers keep a list of students whose parents have consented, send the students to the computer room perhaps telling us a first name only, and keep the parental consent forms until the beginning of next semester. They should be destroyed after that.

If there are questions:

Please contact
Sabra Spaw at
(979) 219-1230 or (979) 247-4890 or
sabraspaw@yahoo.com.

Or Don Cook at
512 237-9404 (office hours)
dcook@sprd1.mdacc.tmc.edu

Parental Consent

<u>Electronic Educational Materials on Environmental Health-- Focus Group</u>
Consent for Parents

Name of Child ____________________ School _______________

<u>Activity Description</u>
Children will be offered the choice of participating in a study to determine the effectiveness of electronic and web based learning materials. Students will be observed as they use electronic learning materials for the purpose of documenting how well the material conveys information to the student.

The Internet sites have been developed by the Education and Outreach Program of the UT M. D. Anderson Cancer Center, Science Park-Research Division in Smithville, TX. The sites or electronic media are designed to provide age-appropriate material about environmental science, nutrition, sun safety, and modern biological research. Students will spend up to 30 minutes going through the sequence of computer screens while they are observed by an education researcher. Students will then be asked a series of questions about the material and their opinions about it. The activity will NOT be graded and individual students' names will not be recorded. The information gathered will be used to determine the usefulness and benefits of the electronic materials and to make improvements in them.

The website was developed by certified teachers working at Science Park during the summers of 1999, 2000, and 2001. If your child has your permission to participate, please note your choice and sign this form. If you would like further information before deciding you may:

1. Contact your student's teacher at telephone ________________
2. Contact the UT M. D. Anderson Outreach and Education Office at 512 237-9335.

Name of Parent or Guardian (printed) ___________________

If you wish to say YES and consent to allow your child to participate, please sign the line below and send the form back to school with your child:

Parent Signature:_____________________ Date:_________________

If you wish to refuse for your child to participate, simply do not return this form. Inquiries may also be directed to the U.T. M. D. Anderson Cancer Center, Science Park Smithville Principal Investigator on this study, **Dr. Robin Fuchs-Young (512 237-9547)** between 8 p.m. and 5 p.m. weekdays.

Participant Consent

Phases of Evaluation and Feedback of Educational Materials on Environmental Health--Focus Groups for Electronic Media Content

Consent Form for Focus Group Participants

I am being asked to be part of a study of computerized education materials about health and the environment. I understand that if I wish, I can agree to look at the educational materials on the computer, and to answer questions about what I think about them. I understand that I should tell the person asking the questions what I honestly think. I understand that the person will ask me some questions, watch me look at the screen, and then ask me a few more questions. I understand that this will take place at my school and will take about 30-45 minutes. I will not have to do anything except look at the materials and answer questions about them. I understand that I can say that I do not want to look at the screens and answer the questions and say no to participating at anytime. I understand that I don't have to answer any question that makes me feel uncomfortable. I can stop at anytime even if we are not finished.

I understand that my name won't be used or written down. I will fill in the date below, to show that I am willing to look at the materials and answer questions.

Date________ (student)

Observer/Investigator - I feel that this student has given his/her consent to participate (initials of observer)__________ date__________

Pre-perusal Interview Questions

Focus Groups Data Fields

Pre-Session Interview School Code__________

Date _________________ AM PM

1. Gender M or F
2. Grade__________________
3. Age________
   What is you ethnic background? (1) African American, (2) White, (3) Hispanic, (4) Asian American (5) Pacific Islander, (6) Mixed, (7) Other
4. What language is primarily spoken at home? ___________________
5. Do you have access to computer at home? (yes or no)
   At school? (yes or no)
   At a friend or relative's home? (yes or no)
6. Do you have access to Internet at home? (yes or no)
   At school? (yes or no)
   At a friend or relative's home? (yes or no)
7. How frequently do you use the Internet?
   (1) every day, (2) A least once a week (3) at least once a month,
   (4) not very often, (5) never
8. What do you use the internet for the most?
   (1) games, (2) homework, (3) email, (4) search for information,
   (5) music, (6) shopping, (7) other _______________
9. Have you ever used the internet at a city library? (Yes or No)
   Anywhere else?_________
10. How much to do you feel you know about diseases or illnesses caused by the environment?
    (1)a lot, (2) pretty much, (3) some, (4) a little, (5) none
11. How often have you used the Internet to look up information about health?
    (1) every day, (2) at least once a week, (3) at least once a month,
    (4) Not very often, (5) never

Pre-perusal Interview Questions (continued)

Module specific pre-session questions:

12. Are there things in the environment that can cause you to be sick ?

    Yes, No, don't know

    Can you name one?

13. What illnesses or diseases can be caused by things in the environment?

14. Is it healthy to get a dark suntan? Yes or No

15. Who is Veggie-mon?

16. Do you know what the food pyramid is? Yes or No

17. If yes, what are the foods at the top of the pyramid?

18. How much of these foods should you eat each day?

Post-perusal Interview Questions

Post Session Queries:

44. What is oxidation or an oxidant?

    Can you name one?

45. Is it healthy to get a sunburn? Y or N

    A dark suntan? Y or N

46. Who is Veggie-mon?

47. Are there things in the environment that can cause you to be sick? Y or N

    Can you name one?

48. What illnesses or diseases can be caused by things in the environment?

49. Do you know what the food pyramid is? Y or N

50. If yes, what are the foods at the bottom of the pyramid?

51. How much of these foods should you eat?

51A. If you are going to the beach or swimming pool for the day, what things should you do to avoid getting too much sun?

Obervation

Observer Script: Now please take a look at whatever portions of this website that you wish to see. Don't worry about how much you get done. Just look at whatever parts you are most interested in.

Observations and Student Comments During Perusal of Website

Record path taken and landmarks used (see template, next page)

Identify the pages at which the student lingered and the pages scanned briefly

Identify the pages skipped.

Identify whether games and quizzes were entered and/or completed.

Note verbal comments during site use. Write them on the bottom of the flow chart.

(The following fields are to assist in tracking through screens)

Time Spent on Main Screen ___

First Branching Choice ______________________ Time spent:

Second Branching Choice ______________________Time spent:

Third Branching Choice ______________________Time spent:

Did participant return to Main Screen _________ Use Tick mark for number of times:

Likert Scale observations:

At what level is the student's browser technique "Back/Forward" Buttons?

(1) unfamiliar, (2) slow (3)comfortable (4) familiar (5) sophisticated (6) did not use

Site Techniques –Clicking on Choices

(1)unfamiliar, (2) slow (3)comfortable (4) familiar (5) sophisticated (6) did not use

25. How much did the student display interest in the Web site?

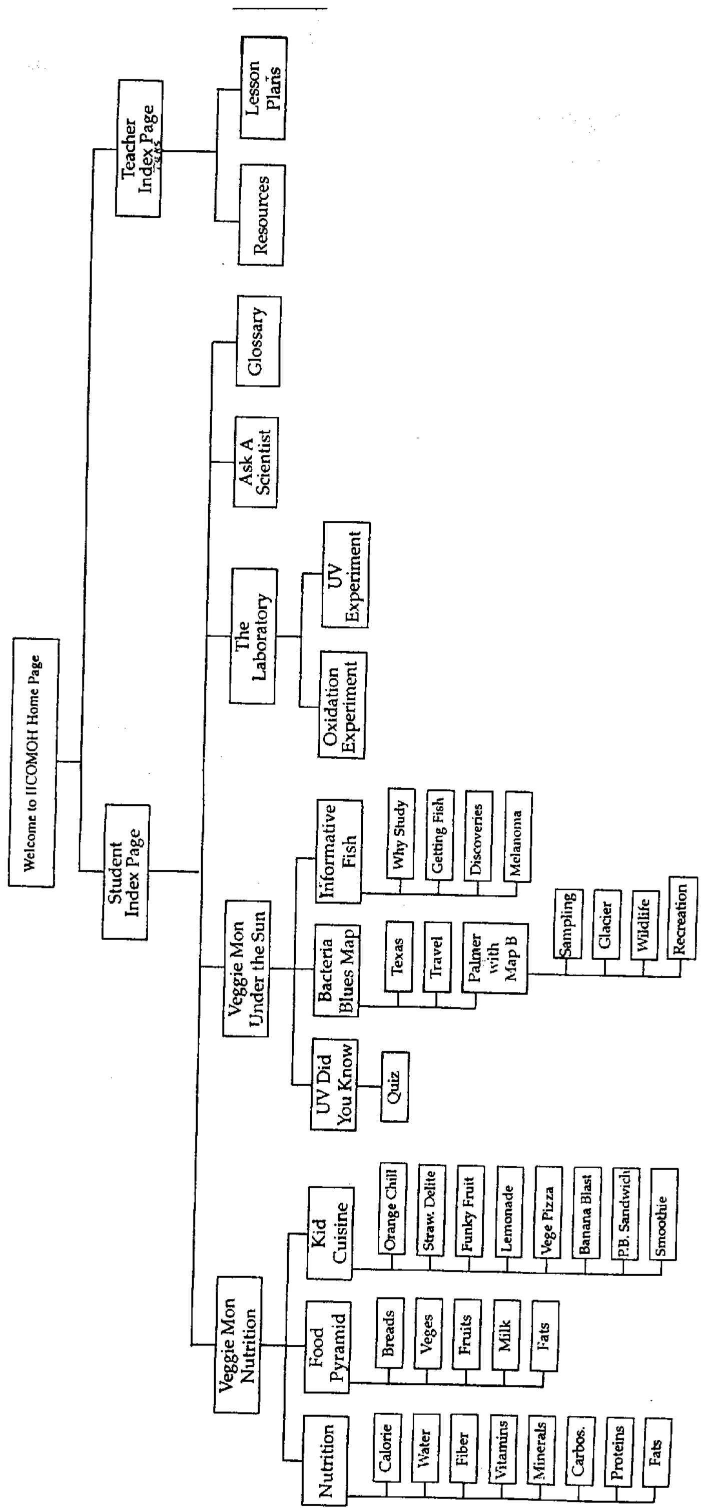
    (1) a lot, (2) pretty much (3) some, (4) a little, (5) none

26. Was the computer running: fast, normally, or slow? Comments ___________

27. How does the child act when (if) the computer is slow to respond?

    Angry, Frustrated, Bothered, Unaffected, Other ___________

Observation (continued)



First Branching Choice Time Spent ____

Second Branching Choice Time Spent ____

Third Branching Choice Time Spent ____

Did Participant return to Main Screen ____ Use tick mark to show number of times

Focus Group Questions

Post-Perusal Interview (Focus Group):

This interview will be conducted after the student peruses the web site.

SCRIPT: **I'm going to ask you about your opinions about the website. Tell me what you really think, not what you think I want to hear. I want to know what each of you thinks, so we are going to give everyone a chance to give their opinion so please speak one at a time. Try to tell me what you really think, not what you classmate thinks.**

28. What did you learn that you didn't know before?

29. How will you use the information you learned?

30. Does it make a difference to you?

31. How interesting is this web site?
    (1) a lot, (2) pretty much, (3) some, (4) a little, (5) not at all

32. How much information on the web site did you not understand?
    (1) a lot (2) pretty much (3)some, (4) a little, (5) none

33. Which do you remember most, the information you read or the pictures you saw?

34. How much did you like the pictures/cartoons?
    (1) a lot, (2) pretty much (3) some, (4) a little, (5) not at all

35. Do you feel the information is correct? Yes or no

36. Why or why not.________

37. Do you feel the information is current or up-to-date? Yes or no

38. Why or why not.__________

Focus Group Questions (continued)

39. Who provided the information on this Web site?

37. What did you like best about the site?

(1) quiz, (2) pictures/cartoons, (3) information (4) recipes (5) other__________

38. What did you like least about the site.
(1) quiz (2)pictures/cartoons (3) information (4) recipes (5) other____________

38. Would you ever look at this Web site on your own, without someone asking you to look at it? (yes or no)

40. Is this a web site that you would tell a friend about? (Yes or no)

41. Do you visit similar Web sites on health, the environment or science? (Yes or no)

42. If yes, which ones?_____________

43. Please give a few words to describe this web site.____

VITA

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EDUCATION

August 2003 — **Texas A&M University; College Station, Texas**
Master of Science, Science and Technology Journalism
Coursework included research methods, journalism issues, reporting, and equine production, genetics, and college teaching.

August 1991 — **Texas A&M University; College Station, Texas**
Bachelor of Arts, English with technical writing specialization
Courses included rhetoric, technical writing and editing, scores of literature, journalism media, Spanish, and various animal science classes.

EXPERIENCE

1996– now — **Accuwrite Designs; Amarillo, Texas**
Self-employed editor and writer. Clients include VuePoint, Inc., Baylor University, David Weekley Homes, Black & Decker, and Opera Systems, Inc.

2002 — **Opera Systems, Inc.; La Grange, Texas**
Communications Coordinator

1991-1996 — **Professional Datasolutions, Inc.; Temple, Texas**
Positions held include technical writer and editor, manager of publishing, and marketing writer and designer.

1986-1991 — **Ocean Drilling Program; College Station, Texas**
Positions held include assistant coordinator of public information, assistant supervisor of accounts payables and receivables, and accounts payable clerk

PROFESSIONAL ASSOCIATIONS

2001– now	American Horse Publications
2001– now	National Honor Society in Journalism and Mass Communication
2001– now	National Science Writers Association
1991– now	Society of Technical Communication

RECENT PUBLICATIONS

2001	Cloning, Part II: Caring or prolonging the hope? *Texas Veterinarian*
	Cloning, Part I: A Brave New World, *Texas Veterinarian*
	Synthetic Progestin Therapy in Pregnant Mares, *Texas Veterinarian*
	Double Take, *The Battalion*
2000	Kids Hoof It With Science, *The Battalion*
	Healthcare 2000, *Insite*
	Coping Through Hoping, *Insite*
1996	PDI Users Conference Proves Successful, *Merit*

TOP AWARDS

1996	A+ Customer Service, PDI Advisory Council Meeting materials
1991	International Assoc. of Business Communicators' Award for Excellence