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EDUCATION OVER THE INTERNET

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The global network of computers, called the Internet, offers special challenges and opportunities to educators for delivering educational programs. The opportunity of education over the Internet has been recognized almost since an interconnected network of computers was conceived. However, access to the Internet by the general public has been low; in 1995 only 4–6% of the people in the U.S. have access. Nevertheless, access has been expanding rapidly, and with the advent of the $500 network computer, is expected to increase substantially over the next few years. Information available over the Internet is also expanding rapidly. In March 1996, the Megellan search engine returned just over 13,000 hits for the keyword "wildlife." Just 3 months later, in June 1996, the same search returned almost 19,000 hits—a 46% increase. The same search engine returned approximately 32,000 hits for the keywords "endangered species." Thus, there is lots of information already available on the Internet concerning fisheries and wildlife. The Internet may be particularly relevant to extension education because people searching for information or educational programs over the Internet fit the model of helping people help themselves. The purpose of this paper is to examine (1) some of the forms of Internet education, and (2) some of the issues related to educating over the Internet. I would like to acknowledge Ken Kingsley for several of the ideas presented in this paper. I would also like to point out that I am far from an expert on this topic; I would characterize myself as a user who could not find anyone appropriate to put these thoughts together.

FORMS OF INTERNET EDUCATION

Education over the Internet can take many forms from simple email correspondence to formally structured, for-credit courses. Although related in many aspects, some forms may be better suited for different audiences, and each present different issues that need addressing. I recognize six somewhat overlapping forms of Internet education: email information responses, newsgroups, discussion groups, file or information transfer, formal classes, and virtual educational environments.

Email Information Requests

Email is the most basic form of Internet access, and is typically the form that most users are first exposed to. As such, it is probably the most widespread form of Internet access. With this form of access, users can communicate with anyone else who has similar access and capabilities. Mail is usually delivered within a few hours, often instantaneously. Messages more appropriate for someone else can be routed to that person. Documents and graphics can be attached to a response.

I suggest that responding to email requests for information is or will become a very time-consuming proposition for extension specialists unless you develop strategies to deal with it. Although I have not collected hard data, my recollection suggests an exponential increase in the number of information requests that come to me via email. I have had an email account for 8 years and began to receive my first requests for information in 1991. From 1991 to 1994 all email requests for information were from other colleagues at the university or at other universities. Beginning in 1994, other specialists within extension began forwarding questions they had received. Many of these were questions passed from our Agricultural Communications Department. In 1995 I began to receive information requests from clientele directly. The only possible reasons for the increase in these latter requests are my department's and OSU' extension home pages on the world wide web (WWW) and my email address on my business card (I do not give a lot of these out). I know that many of you who are more easily identifiable as the local expert because of home pages, or because of promoting your programs, must receive many more requests for information than I do. Perhaps upwards of 100/week.

Because of the increasing demand for information from this source, specialists will need to develop strategies for coping with the influx of requests. I offer the following suggestions for ways to handle these requests. Because information requests get combined with other email, you might consider a separate address for your extension information requests, or even separate addresses for different types of information (i.e., fish ponds, animal damage control). These addresses might be posted on WWW sites, or identified on your business card. Although this will not reduce the number of requests, it would likely increase your efficiency by allowing you to partition your time into extension and nonextension communications. I find for example that I will get several very similar queries in response to a news article (e.g., hanta virus and deer mice) or a presentation that I gave. If these were collected for a few days, you could respond to all of them with a single 1–2 paragraph response. Another way of dealing with these requests is by developing a list of standard answers that can be copied into your response. Questions like, "Where can I buy fish for stocking my pond?" which are asked repeatedly can be answered from a list of stock answers (no pun intended). I often simply respond with send me a mailing address so I can send you a publication.

Another way of dealing with email requests is the autoresponder. An autoresponder sends a return message to the sender. The autoresponse could say we received your information request and will respond as soon as possible. In the meantime, the following is a list of sources for information that might be helpful to you in the future. Although this autoresponse will not prevent you from having to respond to the information request, I believe that the information sources it provides could reduce the number of times that that person may come back with other questions.

One final thought concerning email requests has to do with what is an appropriate question or information request to be handled via this form of communication. By its very nature, email is best suited for rapid, short responses. Email users expect rapid communications, so it is best not to let these things wait for several days before you respond. Also, the responses should be short and concise, 1–3 paragraphs at the most. Many of the questions that specialists deal with on a day-to-day basis require site-specific information that can only be obtained by asking several, often in-series, questions. This type of dialogue should be avoided via email unless you just love to type and communicate back and forth over a few hours or days. I find that these types of information requests are better handled over the phone and respond with a request for a phone number as soon as I find myself thinking of a series of questions to ask the client. Thus, if you do not have a standard or almost standard answer available, you will likely be better off making a phone call.

Newsgroups

Newsgroups are lists of Internet clients that all have a common interest (e.g., animal damage control, farm ponds, butterfly gardens, etc.), and as such provide an opportunity to reach a target audience with a tailored message. People with common interests are notified of the lists' existence via conventional means (newsletter, word of mouth) or they can find them by searching the Internet. A person becomes a member by subscribing to the list, usually by sending a message to the list manager. The list manager has the option of making the list an open list or he/she can supervise the list and accept or reject subscribers. Everyone on the list receives, via email, any message that is sent to the list. Because of the relatively narrow interest of the list members, a specific message or announcement can be tailored to the audience, and will likely be broadly read. The major advantage of newsgroups is they allow and encourage dialogue among list members.

You will only want to create a newsgroup if you anticipate regular (every few days) postings. Members unsubscribe to inactive lists, and developing a successful dialogue among list members requires some practice, which can only happen on an active list. Thus, before creating a newsgroup you want to be sure that you have a relatively large (> 100) audience, and that there will be regular postings to the list. This means that for many, perhaps most of us, creating our own lists will not be feasible or effective. However, thousands of lists are now active and you may be able to reach a captive audience simply by identifying the list and targeting it with your message. Certainly, I would consider announcing any new publications or videos that may be of interest to the list members.

Websites and File Transfer

Homepages on the WWW have become almost as common as an identification card—everyone has one. There are currently 1000's of websites that provide fish and wildlife related information, available to Internet users. Information on these sites comes in two forms, text at the site and files or documents that can be downloaded from the site. About 70% of the state Extension Services in the country have homepages and are beginning to make short (< 12 pages) publications available. Clients must use a file transfer protocol (FTP) to download the publication or use a publication distiller such as Adobe Acrobat® to view or print the publication. This information source is expanding rapidly, and I suspect that by the turn of the century many or most of our clients will be receiving information by contacting websites. Within 2 years there will be a national webhouse of extension publications that will be a source of all extension publications in the country, or at least those that are published electronically. Information regarding fisheries and wildlife resources available at websites varies from strict advertisements for products and publications to factual information of the type that the Extension Service has traditionally brokered. Many sites contain links to other sites with similar or related information. There are many issues related to providing information on websites that I will discuss in the last section of this paper.

Formal Classes

Formal classes offered over the Internet have been growing in number over the past couple of years and in general, you might say that educators are cautiously optimistic about the opportunities this form of education provides. Offering formal classes over the Internet is consistent with the objectives of many universities of expanding access to programs and in providing nontraditional educational opportunities. Internet education offers the capability of formal classwork off campus and at times (anytime of day) and over time-periods (several hours to a few weeks) that do not fit in the format of most university-based courses. However, formal classes over the Internet are not for everyone or for every course. Students that do best in these educational settings tend to be highly motivated self-learners. Students who need group-learning experiences, the regimentation of regularly scheduled assignments, or greater access to teaching staff to resolve questions and enhance

understanding will, in general, do poorly with Internet education. Fortunately, the profile of the successful Internet learner is consistent with that of Extension's traditional clientele. Courses that require hands-on laboratory exercises or field trips will be less easy to adapt to an Internet mode of education.

Formal classes over the Internet can be classified into 4 categories, fully developed, dependent, supplemental, and informational. Each of these provide opportunities for extension education.

Fully Developed Courses—Fully developed courses are classes that are completely taught via Internet. Fully developed classes generally have course notes posted on the Internet, and typically these are embedded with self-learning exercises and hot-key access to terms and definitions. For example, a course that contained a discussion of population growth would link to a glossary for any terms that the student might not recognize. More importantly, the "lecture" might contain a graphics module where the students could visualize the effect on population growth of changing litter size, interbirth interval, age at first reproduction, or other parameters directly related to population growth rates. Fully developed classes typically contain assignments that are completed at the terminal or submitted for grading and returned via email. Finally, these courses typically have examinations that are completed over the Internet. Security, or student verification, still is problematic for testing situations, but will likely be resolved in the near future. Extension programs that have well-defined content and that do not require field or laboratory experiences could be presented state- or nation-wide as a fully developed course.

Dependent Courses—Dependent courses, like fully developed courses, rely heavily on Internet capabilities. Typically, these courses are taught via traditional lecture or video, but have a component that can only be accomplished via Internet. Email submission of class projects is the simplest example, but directed learning tasks such as crossword puzzles that develop terminology, or graphics representation of timber harvest schedules and habitat components could also be incorporated. Dependent courses often contain a component that teaches students how to use the WWW to find additional information on a topic. Dependent courses could also contain all course components except for a field or laboratory component. Several currently existing Extension programs, such as the 4-H Habitat Judging or Master Gardners, could be adapted as dependent courses.

Supplemental Courses —Supplemental courses are the most likely to be adapted to current extension education programs. These are courses where the Internet provides a source of supplemental course material. Course notebooks or handout materials may be made available via the Internet, as might extension publications. The vast amount of information on the WWW provides additional information that self-learners could use to supplement lectures, seminars or other traditional teaching methodologies.

Informational Courses—Informational courses are traditionally taught courses for which optional information sources on the WWW are identified for students. As extension publications become more widely available on the WWW or as we identify websites that provide factual information, just about any extension program could be considered informational. Many of you probably already have informational Internet courses and did not even know it.

Vees and Moos

Virtual Educational Environments (VEE) or Multi-user, Object-Oriented programs (MOO) are online worlds (we might call them ecosystems) that are created by computer commands and are explored and manipulated via online conferencing. Participating in a VEE has been described as being something like being part of an interactive novel. Participants in this environment are designated by characters that are displayed on all "player's" screens. They talk to one another via the keyboard, and use commands to move around the environment and to manipulate objects within the environment. Creation and support of a VEE requires the development of sophisticated programs and linked databases. However, I do not doubt that an ecosystem VEE will be online in the near future. The participation in a VEE has great educational potential. For example, a wetland VEE might be created that linked lists of plants and animals to different environmental parameters such as water depth, pH, temperature, and many others. Participants in such a wetland VEE could learn what might happen to the fauna and flora if the water level was decreased by 50% or temperatures were increased by 5°C. To learn more about VEEs and MOOs, I suggest you view the following sites on the WWW ("http://web.syr.edu/~salsbery/dumoo.html," or "http://www.athena.edu/vee.html").

ISSUES WITH INTERNET EDUCATIONS

Education over the Internet involves a number of issues that educators and administrators need to recognize and address. Some of these issues fall in the category of awareness, while others will require substantial investments before meaningful advances can be made in Internet education at a particular site.

Quality Control

The issue of quality control is critical for extension educators because of their role in providing objective, scientifically based educational programs. There are at least two levels of quality control that education over the Internet should address: (1) review of materials posted on Internet servers by extension educators, and (2) review of sites that are linked to webpages. Review of materials posted on the Internet by extension educators is of particular importance because long-term credibility of the organizations will depend on this level of quality control. Because almost anyone who has access to a server and who has some computer skills can begin posting ("publishing") educational information on the WWW, many states have begun to develop policies concerning posting of materials; see your extension administrators to determine if such policies have been developed for your organization. These policies should contain provisions for peer-review of materials in a manner consistent with any other extension publication. Because you can write it today and have it available to the world this afternoon does not mean it will be scientifically credible or even attractive to readers. Another standard policy concerning quality control is single server posting. Many academic or administrative units, from university departments to county extension offices, within most state extension organizations have or likely will have servers providing access to the Internet on which materials could be posted. Multiple servers within an organization increase the likelihood that a particular "publication" will be posted more than once, and worst yet, that multiple editions of a publication will be posted. Thus, extension "publications" posted on the WWW should only be posted from a single server.

The second level of quality control for Internet education concerns the common practice of homepages or websites linking to other websites with similar information. It appears to be a very in-vogue and valuable thing to do; it is hard to find a website that does not offer such links. A well-designed page of resource links is a gold mine for people searching for information on a particular topic. Although many Internet educators may disagree with me, I suggest that such links from extension homepages could be construed as recommended reading. As purveyors of objective, scientifically credible information, I believe we should be concerned about our reading lists. There is lots of information concerning fish and wildlife resources available on the WWW, but the objectivity and level of peer-review is likely to vary considerably when it is available from organizations ranging from the U.S. Fish and Wildlife Service to Greenpeace.

I offer the following suggestions for extension educators who wish to provide resource links on their websites. First, avoid establishing such links unless you have reviewed the materials at the site you are linking to,

and have some plan for periodic review. Second, consider using a standard disclaimer to the effect that the links are provided as a service and do not imply an endorsement by your organization with respect to objectivity or factual basis of the information. Another possibility is to develop a rating system based on some combination of criteria related to objectivity, bias, factual basis, and peer review. Links to sites might range from Not Rated (NG—see disclaimer above) to Peer-Reviewed publications (PR) to Factual but Biased (FB) or other combinations of review. Because websites change continually, any rating system should also contain periodic review and a date indicating when the site was last reviewed.

Security

There are many things that can be said about computer security with respect to Internet education. However, I am only going to focus on the single topic of ensuring integrity of educational materials that are unbiased and objective presentations of scientific knowledge. This is the foundation of extension's credibility. If computer hackers can gain access to National Security Council and Department of Defense computers, the possibility that someone could access and change extension educational materials posted on the Internet is not far-fetched at all. Imagine for a moment what an animal-rights advocate might be able to do to some of the many animal damage management publications that extension produces. The addition of a sentence or only a word or 2 could drastically change the meaning or intent of a publication. And, subtle changes could be very difficult to detect. How soon might you find out that the word "not" had been added in a few places to one of your publications? Probably not before many 100s or even 1,000s of copies had been downloaded. Integrity of materials can be ensured by never posting documents in a form that can be modified. Most extension publications will only be accessible in a Portable Document Format (PDF) as is the CD-ROM version of the Animal Damage Control Handbook (Hyngstrom et al. 1994). PDF files can be downloaded, viewed, and printed from several different platforms with the original page layout and typography. More importantly, PDF files cannot be altered.

Training of Staff

Training of staff is another issue that extension's administrators need to focus on. The rapidly changing technology associated with computers and Internet communications will require that extension personnel receive training to effectively use these educational opportunities. Training needs will range from simple and effective use of email to website editing depending upon the needs of extension personnel. In most cases, short seminars can be effective for explaining the basics of much of the software that Internet users need to be familiar with.

Funding and Technology Support

The final area of concern to all administrators is funding for the technology and supporting the electronic infrastructure. By its very nature, equipment and software purchased this year will be obsolete or much less effective compared to new technologies next year. Most universities now assess students some technology enhancement fee that helps upgrade computer labs and support services. However, in most cases that I am familiar with, upgrades of hardware and software for non-student users (i.e., extension personnel) comes much more slowly. Extension personnel will not be able to unleash the power of the Internet education without regular hardware and software upgrades. Technology support will be needed to ensure that the hardware is functioning properly. Furthermore, effective Internet education will require webpage designers and other software specialists in much the same way that extension videos require electronic media specialists.

CONCLUSIONS

Education over the Internet provides extension educators a vast opportunity for expanding and motivating audiences. Several different modes of education are now possible, and undoubtedly many more will arise in the near future. I suspect that within the next 10 to 20 years, education over the Internet will be the primary means of extension education. Thus, extension personnel and administrators need to begin strategic planning in order that extension services are well positioned for education in the next century. This planning will need to address funding and technology support, quality control, security, and training.

LITERATURE CITED

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