Life After Lectures: The Internet as a Resource for a Senior Undergraduate GIS Course

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This paper explores potential uses of resources available on the Internet to assist students with a course-related GIS project, and to prepare them for continuing involvement with GIS after the classroom. A homepage was constructed for a new fourth year Applied GIS course at the University of Guelph (http://www.css.uoguelph.ca/geo/home448a.html). The course homepage was designed to integrate information that students could use for their projects and, recognizing that many of the students were in their final semester at university, to investigate opportunities available after graduation. The students evaluated the homepage at the end of the course, and indicated that they found the Internet was an excellent way to become aware of the broader GIS community, and they particularly appreciated the recognition this course gave to their career goals.

INTRODUCTION

During the past several years, use of the Internet as a means to convey cartographic and GIS information has grown at a pace few could have predicted. An incredible wealth of diverse information is now available at literally thousands of sites created by governments, universities, private companies and individuals. This instantly accessible desktop resource is changing the way researchers seek and disseminate information, and in some cases, even the way research is conducted. It is increasingly common to find URL addresses accompanying print versions of journal articles, while publications such as *GIS World* and *GIS Europe* regularly report on notable sites or developments on the Internet (Sieber et al, 1995; Thoen, 1995, Parsons, 1995). Recent texts on digital mapping also include a discussion of Internet resources (Clarke, 1995; Peterson, 1995).

Making these on-line resources available to students, particularly at the undergraduate level, is a challenge for educators. Apart from the physical constraints associated with providing adequate student access to computers, there is the pedagogical question of how best to integrate this new tool into the curriculum, in a way that best meets students' needs. This report describes the design and implementation of a webpage intended for use in a newly developed fourth year undergraduate course in Applied GIS, at the University of Guelph. Details of the HTML programming to set up the page are not discussed; rather it is the intended use of the homepage, and students' evaluations of how well these objectives were achieved, that is the focus of this report.

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THE COURSE

This twelve-week course required students to design and execute an individual GIS project dealing with a real-world problem in any area of geography. Students were assessed primarily on a written research proposal, a final written report, and a poster display of their project. Because of the wide range of ideas and methodologies developed by the students, the Internet seemed an ideal way to access relevant information and technical knowledge from a global network of experts.

Planning for the first offering of this course coincided with two opportune events. Firstly, the University of Guelph's Teaching Support Services

group (TSS) requested that faculty propose projects aimed at incorporating electronic instructional media, including webpages, into their teaching. Secondly, a new lab equipped with eight networked Pentium microcomputers was opened in the Department of Geography. Internet access, not widely available on campus, would be possible using Netscape on these computers, and the lab would be dedicated to the 25 students in the Applied GIS course during its first offering.

A proposal was developed to design a webpage tailored to the needs of the students in this course. Ideally, the webpage would provide a navigational framework for students to explore various types of course-related information, while at the same time provide numerous "jumping off" points for students to undertake their own searches on their individual topics. The following objectives of the webpage were identified:

". . .the webpage would provide a navigational framework for students to explore various types of course-related information. . ."

- *dissemination of course information*, such as reading lists, assignment instructions, and course scheduling details.
- *collection of bibliographic references* pertaining to the topics selected for projects
- *acquisition of digital maps and datasets* for use in the execution of the GIS projects
- *communication with GIS experts*, for advice on methodological issues or technical problems.
- *familiarization with post-graduation opportunities in GIS*, particularly graduate school programs and employment possibilities.

The last objective recognizes the fact that many of these students are in their final year at university, and will spend significant effort and time during the semester exploring options for pursuing their career goals after graduation. The webpage component that facilitated this effort turned out to be extremely popular, and suggested the title for this report.

THE COURSE HOME PAGE

The Applied GIS course homepage is easily accessible from the University of Guelph homepage which appears as the initial Netscape menu on the department computers. The course page (*Figure 1*) opens with a welcoming banner followed by four clickable icons for quick access to the departmental, college, and university homepages, as well as to the WWW (Yahoo search). The remainder of the course homepage is divided into seven main sections, each delimited with a bold header preceded by a red dot. Together these sections provide links to nearly 200 other GIS-related sites, and are organized around the proposal objectives outlined above. A brief description of each section is provided below, but it is hoped that the reader will access the site to appreciate the information content of each set of links, as well as their hierarchical set-up.

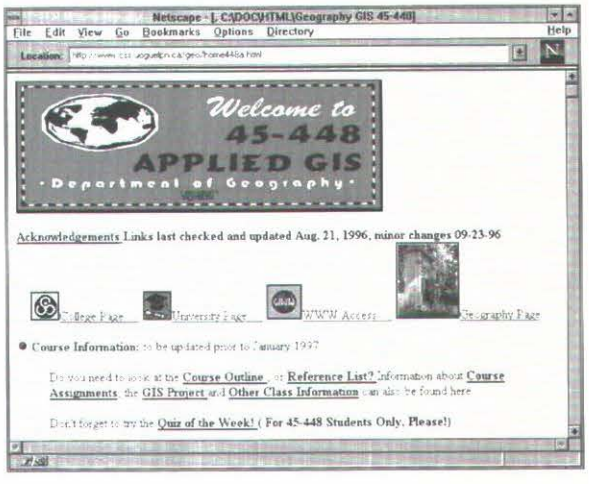

Figure 1: Applied GIS course homepage on the web (Part 1 of 4).

COURSE INFORMATION

All general course information (*Figure 1*) pertaining to administration, evaluation, and scheduling is provided here. A student class list, with email addresses and project topics, is included. The *Quiz of the Week* challenges students to find a particular bit of geographic trivia on the Internet (such as the latitude and longitude of the mouth of the Mersey River!).

REFERENCE INFORMATION AND BIBLIOGRAPHIES

In keeping with objective two (*Figure 2*), this section contains links to sites offering basic technical information (including FAQs and glossaries) and bibliographic information. These reference sites would not only serve to suggest ideas for possible project topics, but would also assist with the literature review once a subject area was selected. Students created an annotated class compendium of their own references (gleaned from hardcopy as well as digital sources), which was added to the webpage.

Numerous links to government organizations, scholarly associations, and private companies involved with GIS are organized in this section. The homepages of many GIS firms provide a listing of current employment opportunities; such sites are clearly indicated with a symbol.

NEWSGROUPS AND LISTSERVS

This section (*Figure 3*) includes extensive information about GIS newsgroups and listservs. Instructions for subscribing to and using over twenty-five GIS related listservs are provided in a tabular format. Corresponding with objective three above, students were encouraged to post queries to appropriate lists when they needed help, and to take advantage of the generously provided technical expertise that exists worldwide.

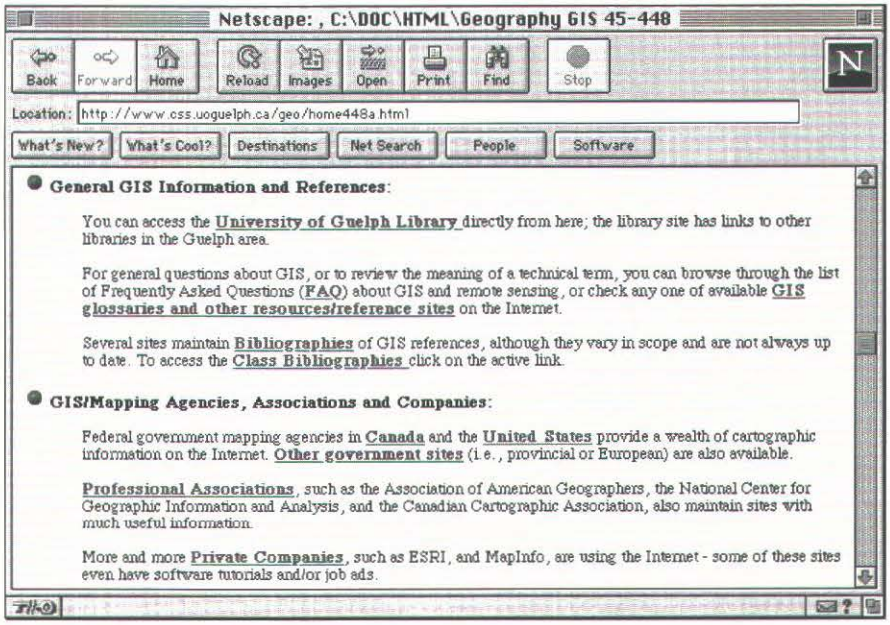

Figure 2: Applied GIS course homepage on the web (Part 2 of 4).

DIGITAL MAPS ON THE INTERNET

Each student in this course worked with different data and a different geographic area. It was anticipated that this section (*Figure 3*), which provides links to various sites from which digital maps can be downloaded, would supply the basemaps and datasets required for many of these projects. *Figure 4* illustrates how sites in this section are organized to facilitate searches.

POST-GRADUATION OPPORTUNITIES

This section (*Figure 3*) of the homepage is devoted to information of special interest to graduating students. It includes links to many sites that

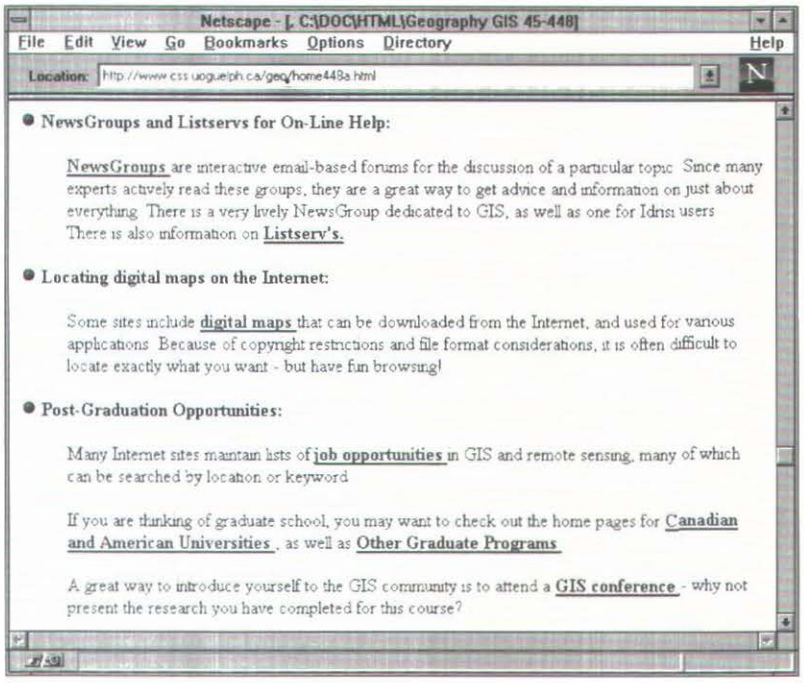

Figure 3: Applied GIS course homepage on the web (Part 3 of 4).

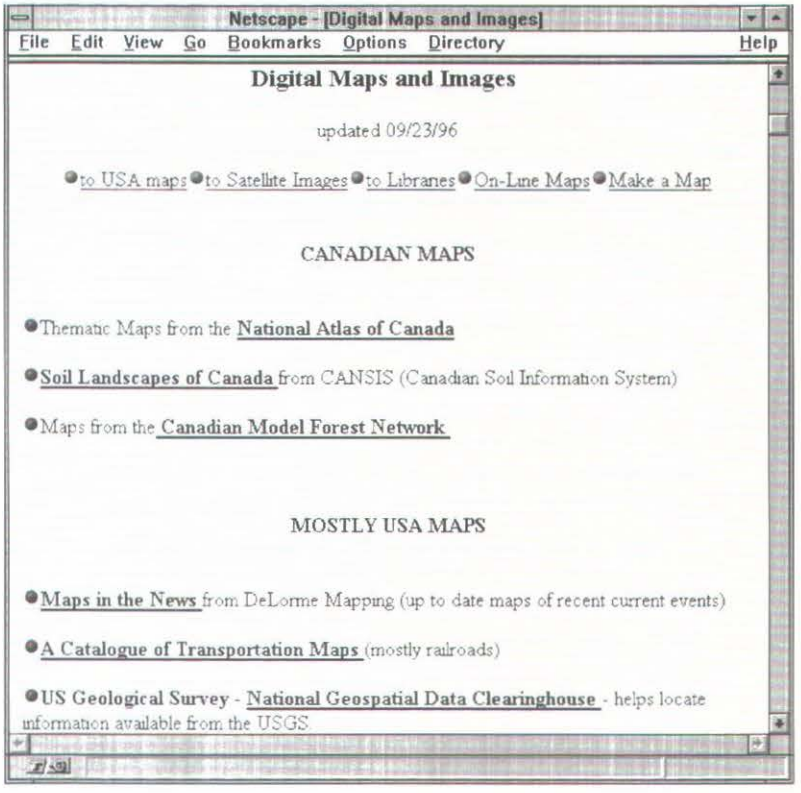

*Figure 4: Menu which appears when **digital maps** is selected from the course homepage.*

contain GIS job listings (*Figure 5*), as well as links to every university in North America. Sites announcing upcoming GIS conferences are included, and students were encouraged to submit the posters they prepared for this course to an appropriate meeting.

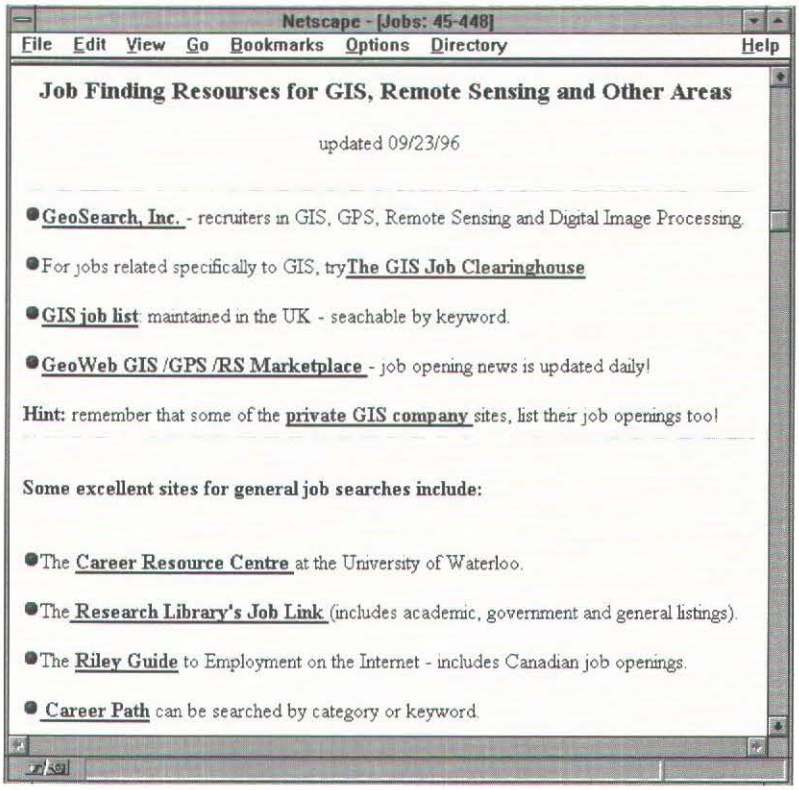

Figure 5: Menu which appears when ***job opportunities*** *is selected from the course homepage.*

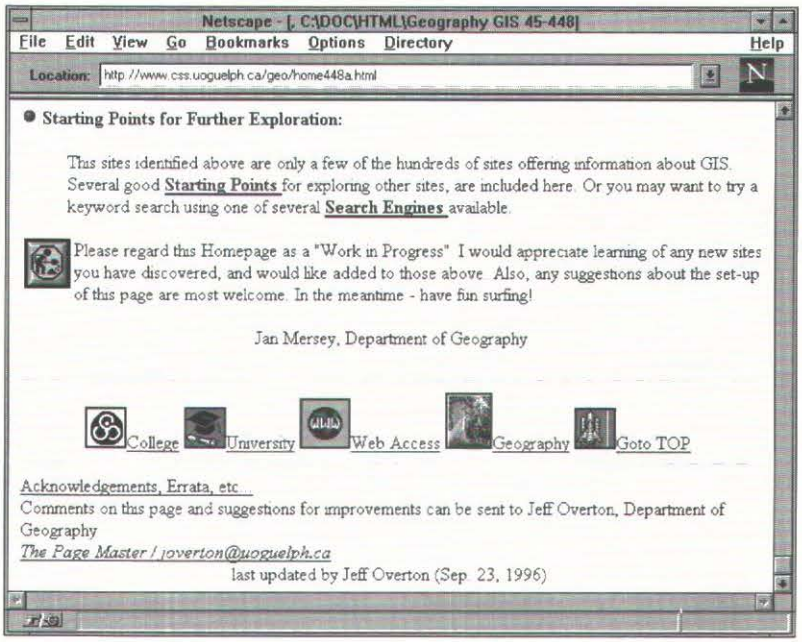

Figure 6: Applied GIS course homepage on the web (Part 4 of 4).

STARTING POINTS FOR FURTHER EXPLORATION

The last section (*Figure 6*) of the homepage includes a list of GIS starting points and search engines enabling students to accomplish their own unique searches tailored to their project theme. Well known starting points such as those developed by Jeremy Crampton (*Cartography Resources on the Internet*; Crampton, 1995) and Kenneth Foote (*The Geogra-*

45-448 World Wide Web Homepage Evaluation

1. Before this semester, had you ever used the Internet?

20% yes, regularly
20% yes, occasionally
10% yes, once or twice
50% no

2. How many times (approximately) this semester did you access the 45-448 homepage?

AVG=30 (Range 6-75)

3. Indicate how useful you found the following components of the 45-448 homepage:

	not useful				very useful	
a) course information:	1	2	3●	4	5	(3.3)
b) GIS bibliographies:	1	2	3	4●	5	(4.1)
c) government sites:	1	2	3 ●	4	5	(3.5)
d) private company sites:	1	2	3	●4	5	(3.9)
e) news groups:	1	2	3●	4	5	(3.2)
f) digital map sources:	1	2●	3	4	5	(2.3)
g) university sites:	1	2	3	4●	5	(4.4)
h) job opportunity sites:	1	2	3	●4	5	(3.9)
i) conference sites:	1	2	3	●4	5	(3.8)
j) starting points:	1	2	3	4●	5	(4.1)
k) search engines:	1	2	3	4	●5	(4.8)

4. How would you assess the overall utility of the 45-448 homepage as a resource for this course?

not useful 1 2 3 4●5 very useful (4.6)

5. Rate how important to you the homepage was for the following purposes:

	not important				very important	
a) provided basic familiarity with the Internet	1	2	3	●4	5	(3.9)
b) helped with my class project	1	2	3●	4	5	(3.3)
c) helped with job/grad school planning	1	2	3	●4	5	(3.6)
d) helped with other courses	1	2	●3	4	5	(2.9)
e) provided non-course related information	1	2	3	4●	5	(4.1)
f) made me aware of the broader GIS community	1	2	3	4	●5	(4.6)

Figure 7: Applied GIS homepage evaluation. Results are shown within the brackets.

pher's Craft; Foote, 1994) appear in the list. As students become more familiar with the Internet they can go directly to such links to find the information they need.

COURSE HOME PAGE EVALUATION

A two-hour training session on the use of Netscape was provided to students at the beginning of the semester. Several short assignments (copies available on the webpage) requiring Internet searches helped direct students toward resources they would find helpful. At the conclusion of the course, students were asked to evaluate the usefulness of the homepage and to suggest any modifications that might increase its effectiveness. The results clearly indicated that not all of the initial objectives were achieved with the same degree of success. A summary of the evaluation results is presented in *Figure 7*.

About half of the students had not previously used the Internet, about 20% were regular users, while the rest had some minimal exposure. During the twelve week course each student accessed the course homepage an average of 30 times, although there was a wide range (from 6 to 75) among

individuals. Generally more experienced users had fewer, likely more efficient, sessions.

Students indicated that overall they found the homepage to be a very valuable course resource, but when asked to assess the usefulness of specific homepage components, some interesting facts emerged. Leading the list of most useful components were the search engines and starting points included in section seven. Since each student was researching a different project theme, it is logical that individualized searches would be necessary. This also suggests that students can quickly learn to navigate on their own throughout the Internet, and that even without a customized course homepage, the Internet could still be a valuable research resource.

". . .students can quickly learn to navigate on their own throughout the Internet. . ."

Another aspect of the course homepage that received a very high rating was the link to other universities included in section six. Although it was not required that students explore any university sites for the course, these senior students had a keen interest in finding out about programs and courses at other institutions. It is important that educators appreciate what a significant instrument the Internet has become for advertising their programs and attracting new students (both graduate and undergraduate). Efforts put into departmental homepage design are not wasted.

On-line GIS bibliographies, included in section two, also received good scores from students. Each student was required to complete a literature review, and sites such as the *GIS Master Bibliography* from Ohio State University were found to be particularly helpful in this regard. The page components providing information on job opportunities and upcoming conferences ranked next in usefulness. Students frequently explored the private industry sites that included job opportunities, as well as the newsgroups advertising jobs in the local area. One student (a teaching assistant) applied for several GIS jobs she located on the Internet, and six students presented their posters at the Annual Conference of the Canadian Cartographic Association in Toronto, at the conclusion of the course.

Page components receiving a rather neutral rating included government sites (section three) and course information (section one). The latter was likely due to the fact that hardcopy course outlines were supplied in class (a departmental requirement). Sites that were found to be of little use by many students included newsgroups and listservs (section four) and sites for accessing digital maps (section five). These results were surprising because during the development of the homepage it was anticipated that both these components would be very valuable in a project-oriented course of this type. It turned out that not a single student managed to download a geographic file that they could use in their GIS analysis! Although four students downloaded files, they found that the formats were incompatible with the GIS software they were using, and reformatting was difficult. Part of the problem also lies in the fact that the majority of the projects were in Canadian locations, and copyrights restrict free access to much of the digital data produced by the Canadian government. It is more difficult to explain the low use rate of listservs and newsgroups. A few students made extensive use of these resources while the majority stuck to browsing and did not venture their own inquires. This is a more challenging aspect of Internet communication to master, and perhaps additional instruction needs to be included on this topic.

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Students were also asked to rate how important they felt the homepage was for various purposes. It is interesting to note that students found the page more helpful for planning post-graduation activities than for helping with their course projects. In general, students did not make much use of the Internet to acquire information for other courses, but they did access non-course related sites regularly. Perhaps the real value of the

homepage, however, is captured by the purpose to which students assigned the highest rating: *it made them aware of the broader GIS community.* Providing students with a comprehensive understanding of their discipline, and an appreciation of the resources and opportunities that exist worldwide, are fundamental learning objectives of any university program. The Internet has an important role to play in helping educators achieve this aim.

CONCLUSION

The integration of a custom-designed webpage into this senior undergraduate course, as a means to facilitate exploration of GIS resources on the Internet, proved to be an extremely worthwhile experiment. Students not only gleaned information from sites that was pertinent to their GIS projects, but appreciated the recognition the course gave to their personal career goals. Many students had a strong interest in continuing their involvement with GIS "after lectures" and found the Internet an excellent way to investigate graduate school and job opportunities. Discovering individuals and agencies from all over the world that share an interest in this rapidly evolving technology and its applications added a unique dimension to this course that could not easily be gained through other means.

A valuable addition to the webpage would be the completed student projects, including both maps and text. Having their own work showcased on the Internet would allow students to creatively demonstrate their skills to potential employers or graduate supervisors. Arrangements might be made with faculty at other institutions to assess and comment on the student projects, providing feedback for those wishing to publish or present their work at conferences. Finally, the webpage evaluations identified certain features that need additional attention. In particular, more instruction on the use of listservs and newsgroups must be provided, and efforts made to establish some friendlier solutions for converting digital files into formats compatible with department software.

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