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ABSTRACT
                This paper presents a high-level course in computing for
non-majors offered at Queens College (New York). The course focuses on the
acquisition and presentation of data and information. For data acquisition,
the course will give the students high-level mastery of the Internet. For the
presentation of information, the students will learn multimedia authoring
systems such as Toolbook and Director, but the primary focus will be on World
Wide Web publishing. The course will be structured around: (1) a lecture
which stresses high-level mastery of the software tools; (2) exploratory,
hands-on supervised lab sessions in a specially constructed lab; (3)
assignments which require students to continue, on their own, the exploration
begun in the lab; and (4) a support network of graduate and undergraduate
student aides. (Author/DLS)

A Course in Internet / Multimedia for Non-Computer Science Majors

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Abstract: The second course for non-computer science majors is presented . The course focuses on the acquisition and presentation of data and information. For data acquisition, the course will give the students high level mastery of the Internet. For the presentation of information the students will learn multimedia authoring such as Toolbook and Director, but the primary focus will be on Web publishing. The course will be structured around (1) a lecture which stresses high level mastery of the software tools, (2) exploratory, hands-on supervised lab sessions in a specially constructed lab, (3) assignments which require students to continue, on their own, the exploration begun in the lab, and (4) a support network of graduate and undergraduate student aides.

Background

At Queens College, we offer a novel first course in computing for non-computer science majors. This course, CS10, was developed with the support of FIPSE (U.S. Department of Education ,1990-1993) and the ILI program of NSF (1989), and focuses on teaching students who are mostly non-technical, to become high-level "power users." The course provides two hours of lecture per week and an additional two hours of an intensive supervised lab/recitation where the students work on "lab experiments" to explore the features of various software packages. The NSF funds were used to build the lab and the FIPSE funds supported the curriculum development.

This course differs significantly from other "software tools" courses in that students not only learn how to use software "tools" such as wordprocessors, spreadsheets and databases, but they learn how to **program** in those environments as well, using the macro and programming tools provided by those packages. The course stresses the idea that all software is "model-based", and by discerning the model underlying the software, different packages can be more easily mastered. Students are not only taught the use of specific programs; but how to master new software by themselves. Computer science concepts such as algorithms and programs are presented in a useful context. They are better understood and assimilated than if taught abstractly or in contexts that are less useful for the non-major, such as Basic or Pascal.

The course has been a resounding success with the **more than four thousand students** having completed the course. Before its redesign, the course for non-majors had an attrition rate of 30 to 40 percent, mostly women and minority students. Now the attrition rate is negligible. Despite the demanding workload, the course is always over-subscribed, increasing each semester. As **a direct result of their experience in the course**, students seek out other computer and mathematical courses. Students comment on the boost the course provided them in seeking employment. CS10 has been designated by the college curriculum committee as fulfilling a college-wide requirement for a course in "quantitative reasoning." Many departments have required the course as part of their major.

CS20

Due to the success of CS10, there has been considerable interest in a **second high-level course in computing for non-majors.**. We are developing a course which focuses on the **acquisition and**

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presentation of data and information. For data acquisition, students will gain high level mastery of the Internet. For presentation, they will learn multimedia authoring with a primary focus on Web publishing. This course is for those who completed CS10, or can demonstrate competence. While in the past, only science and engineering students needed high level computing skills, fluency with computational environments will be a decisive factor in academic and commercial success.

CS20 will provide students with new techniques and paradigms, allowing them to bring new technological know-how to bear in solving problems **in their own** areas. The focus of CS20 will be on techniques **for acquiring, organizing and presenting that data**. CS20 will provide the general skills required to locate data in and transform it into information. In concentrating this material in CS20, as opposed to within the context of the subject matter, many more resources, techniques, and systems can be covered. Subject matter experts can present their material at a much higher level because the students would have a solid grasp of the "information universe" and the purely technical "how to." CS20 will be structured with the following three parts:

1. **Sources and techniques for global data acquisition** with a primary focus on the structure and use of the Internet.
2. Mastering the concepts, software and methods for use in **presenting information**, particularly the use of **multimedia authoring systems**.
3. Mastering the concepts, software and methods for use in **publishing on the World Wide Web**.

In learning to navigate Internet, students gain access to a vast reservoir of data and information that will transform the kind of work they are able to do. Psychology students can access the "alt." news groups in Netnews, pose questions, and even set up surveys with an international call for responses.

While some systems such as Netscape and Mosaic are available to help navigate the net, "power surfers" will still need to know Telnet, Archie, ftp, WAIS, Gopher, and finger utilities. Thus the first component of the course, Internet concepts and tools, will focus on the following topics:

- What is the Internet and what is it not.
- Resources available on the Internet for teaching and research in various fields.
- Navigating the Internet via Gopher, Archie, Veronica
- WAIS, WWW with Netscape and HTML
- Email (with MIME), FTP, Telnet and Listservers
- Netnews, netiquette and ethics
- Student projects

Instruction goes beyond the fundamentals and aim for the level of "advanced user/ mini-wizard", including the knowledge required to setup and maintain their own web sites and lists.

A Stress on Principles

Since specific software packages evolve and / or are exchanged for newer more powerful ones, **principles** occupy a central place in the course. Practical knowledge is presented within the framework of an understanding of computer networks and communications systems principles. Issues of privacy and the security of information will be covered in depth, as will ethical questions arising in the context of computation and communication. This component will take up one third of the course.

In terms of data presentation, the principles underlying hypertext and hypermedia will be taught through use of multimedia authoring systems (on and off the Web) including **Toolbook** by Asymetrix Corp. and Macromedia's Director software. These systems use different metaphors for the organization and presentation of hypermedia systems. The students will be introduced to <u>multiple paradigms</u> for multimedia construction.

In terms of practical skills, students will learn to create sophisticated interactive presentations which integrate text, sound and video. Specifically they will learn:

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- how to construct simple "books" with hot keys and buttons
- how to create multi-page branching books
- how to create motion and animation
- how to design and create hypertext systems
- how to design and create interactive multi-media
- how to **program** "sophisticated" multimedia applications within Toolbook and Director Toolbook contains an extensive and powerful programming environment, and Director is built around the Lingo programming language. Programming projects, in their area of concentration, will reinforce the programming and analysis skills acquired in CS10. This will be one third of the course.

The final 20 hours of the course will be an introduction to publishing on the World Wide Web. The Web provides the ability to access hypertextually organized documents with links to other documents, images, sound and video clips. With the vast storage potential of the 5 million "hosts" and the effective distribution of computation over the network, it will be possible to write applications of extraordinary beauty and utility. More and more companies are hooking up to the Web and creating "home pages." The demand for people to design applications in this context greatly outstrips the available talent. Students will learn to design and implement fairly sophisticated Web applications. The stress will be on principles and their illustration in the context of contemporary tools. In the second section of the course, students will learn the principles of hypertext within the simpler context of the CD-ROM environment. The Web adds a whole new set of conceptualizations and perspectives. Students need to learn to think in network terms. In this context, multiple threads, timing constraints, data transmission volumes and network bandwidth become important considerations.

How the course will be structured

CS20 is being structured similar to CS10. Twice weekly lectures will be complemented by twice weekly supervised labs. Lecture and laboratory manuals are being prepared and will be revised periodically based on an ongoing evaluation of their effectiveness. The recitation will be devoted to working out **numerous examples** and to giving the students the much needed **supervised hands on experience**. Difficulties can be dealt with by the recitation instructor. Interesting problems and their solutions may be shared.

What will be the impact of the course.

CS20 will significantly improve the quality of computer science instruction for non-majors. Within the next year, enrollment could be 200 students per semester. The limiting factor is the lack of adequate lab space. We have applied to various agencies to help fund facilities devoted to just CS20.

There has been a growing recognition of the need for a **new type of computing minor**. Currently, the computer science minor focuses on the needs of students majoring in the sciences, engineering or mathematics. There is a need for high level computing skills in many other disciplines. CS10 and CS20 courses could form the core of such a minor. Many students currently in this course are Education or Communications majors. Empowering large numbers of people with these skills will have a profound impact on both the educational and business communities.

The need for such a course is not unique to Queens College. We hope and expect that the techniques and course materials developed at Queens could be used by institutions all across the country.