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The Gateway to Information: Development, Implementation, and Evaluation

ABSTRACT

The Ohio State University Library has developed The Gateway to Information, which is a computer-assisted program for undergraduate students. The program guides students in identifying, locating, evaluating, and selecting information independently. The Gateway has been in development for six years, funded by four grants, and has undergone continuous evaluation. No help screens or handouts are needed to use the system.

INTRODUCTION

The Gateway to Information was designed to help undergraduate and eventually graduate students identify, locate, evaluate, and select the most useful information for their needs. Running on Apple Macintosh workstations, The Gateway provides guidance and instruction for students on how to proceed through an information search that integrates the use of print and computerized information. The microcomputer program serves as an online "bridge" to other computer-based systems, enabling the user to apply major elements of a search strategy process by gaining ready access to the text of relevant CD-ROM-based encyclopedia articles and journal indexes as well as print sources. Each time users begin to search the catalog, the

microcomputer program offers a comprehensive search strategy option to lead the user through information sources beyond the catalog. Goals of the project are to teach students the following skills:

- find, evaluate, and select materials that meet their needs regardless of format;
- access and integrate the content of online catalogs and CD-ROM databases easily (even as novice researchers); and
- apply information-seeking and critical-thinking skills with a high degree of independence.

The Gateway has been continuously evaluated by users, and revisions have been made based on the results of the evaluations. Available on nine workstations since spring 1991, access to The Gateway will steadily increase as the library replaces 50 to 100 public catalog terminals with workstations that provide Gateway access. The Gateway's technology is basic and adaptable so the project is transferable to other libraries both conceptually and technically.

THE NEED

Effective problem solving in a complex society requires educated citizens who possess the ability to identify, acquire, and evaluate available information on a particular topic, question, or set of problems. With vast increases in the quantity of information available, most people are simply not capable of coping with this phenomenon, especially because of the increasing necessity for them to use computerized databases to gain access to much of this information.

College students, in particular, need instruction not only in the use of individual databases but, much more importantly, in a comprehensive approach to finding and integrating information—whether in print sources or in online sources. Most instruction that has taken place at the postsecondary level, however, has focused on teaching use of individual sources, including databases, with little if any guidance provided in how to integrate and weigh the usefulness of information obtained from a variety of online and print sources. Moreover, the proliferation of information has intensified the need for students to be able to evaluate information: the challenge often lies not in students' being able to find enough information but in their being able to evaluate and select the most useful for meeting their specific needs. Thus, two instructional needs in "information-seeking" skills must be satisfied: to teach students how to find needed information, using whatever formats are most efficient, then to evaluate that information to select what is most appropriate to the task at hand.

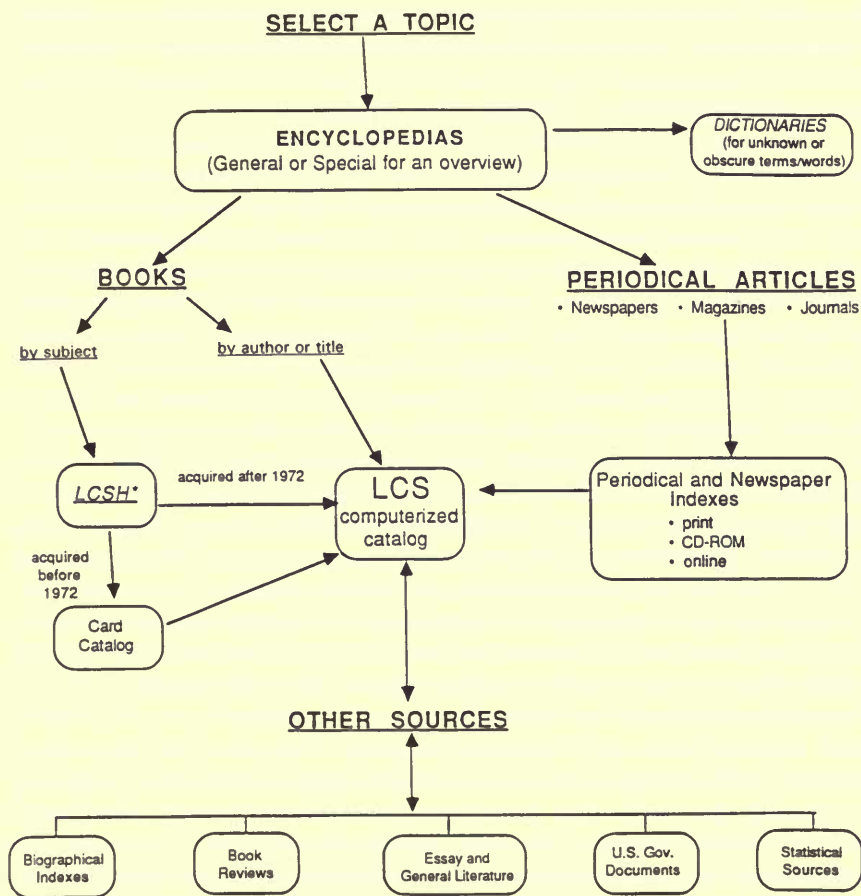
Many studies have shown that most undergraduate students never learn how to use libraries or other information sources effectively. Without instruction specific to information seeking, it has been found that most students will scan the library catalog to identify a few books on a topic, check out the titles that may be available, and attempt to complete the assignment. This is obviously a wholly inadequate approach to information seeking in today's society.

The Gateway to Information was conceived six years ago in the Office of Library User Education at the Ohio State University (OSU) Library in response to the burgeoning demands of the library user education program. The user education program has been in place since 1978, and as OSU Library Director Bill Studer observed, the program had become the victim of its own success. Meeting the staffing demands of the program was becoming increasingly difficult, and given the library's budget, there would be no additions to the staff. The program was reaching annually over 30,000 students with some form of course-related instruction, and another 5,000 students were taught in clinics and workshops. Although that is a large number, it was an inadequate one considering the 53,000 students on campus. Furthermore, it was recognized that to become information literate, students need multiple sessions of instruction. An additional point of concern was the realization that students were beginning to use remote access to the online catalog; this practice resulted in students' reversion to total dependence on the catalog—a dependence librarians had been trying to break by instructing students about the variety of library resources beyond the catalog.

DEVELOPMENT OF THE GATEWAY

Most of the library instruction at OSU has focused on the search strategy concept that is a step-by-step process moving from general to specific information through evaluation and selecting the best information for the need (see Figure 1). In pursuing how to continue the expansion of the instruction program without more staff, it was decided to try putting the search strategy on a computer that would be connected to the online catalog and to CD-ROMs. A grant was sought from the Fund for the Improvement of Postsecondary Education (FIPSE), a granting agency that funds innovative but largely embryonic projects. The proposal came close to acceptance in 1986, and the following year a revised proposal received funding. The project has subsequently received two grants from the Higher Education Act II-D, College Library Technology and Cooperation Grants Program, and a grant from the William Randolph Hearst Foundation for a total of half a million dollars. These four grants were critical to The Gateway's development.

Search Strategy: An Efficient Research



LCS provides only information about location and availability of books and journals; it does not list individual journal articles.

* Library of Congress Subject Headings

Figure 1. Search strategy concept taught at Ohio State University

The University Library provided a full-time equivalent (FTE) position for directing the project, two FTE professional positions, and considerable staff time. The library assigned a professional librarian to the project full time for four months and provided some equipment. The university's Instructional Development and Evaluation unit provided a 10% equivalent FTE evaluation and computer technology expertise for the first two years, with the assistance of a graduate teaching associate. University Systems, the support and provider for the library's online catalog, loaned \$30,000 worth of equipment and provided one-third of a programming position. The Academic Computing Center also provided staffing and equipment support.

The library has provided student programming time, fees for lines to the library's online catalog, software and equipment, and valuable space in the library for The Gateway team. When the project was begun, the programmer/analyst-senior and the systems programmer participated in the evaluation of needed computer equipment. Based on their findings, equipment and software were selected and purchased using funds provided by the University Library and the related university computer center. This equipment included microcomputer workstations, a local area network (LAN), and a connection to the university's Amdahl mainframe computer, which runs the online catalog system.

Macintosh HyperCard 2.0 was used for prototyping The Gateway narrative because it offered the easiest method for creating the narrative and making the necessary revisions. In the beginning, programming activities centered on developing the microcomputer "front-end" for the University Library's mainframe catalog system. This was complicated by the need for the microcomputer to process special characters (e.g., diacritical marks) that are needed for the several foreign languages supported by the online catalog system. The development of this capability, however, had other benefits. It permitted a more flexible user interface that could place all or part of the catalog information anywhere on a microcomputer screen and make possible the combining of catalog data with that from other information sources. Like most online catalog systems, the OSU online catalog was developed for mainframe display terminals that have a fixed display format and access to only one information source. Therefore, this new capability offered a major improvement over existing library information systems and could be adapted by many institutions that had the same limitations in their catalogs.

Programming was started with these underlying structures because they were necessary for implementing the overall project design—to bring together information from different sources utilizing various learning and access strategies. Work began on a single user workstation connected to the library's mainframe-based catalog system and

conversion to the LAN environment where users on several workstations could share a single link to the library's online catalog system.

Incorporated into the project's design was the ability to update both information sources and the narrative/instruction. These features were needed to keep pace with the always changing environment within information systems and information itself. It also enhanced the project's transferability by permitting other institutions to tailor the system to their particular needs. The data communications connection to information sources was intended to be transportable to other institutions with little or no modification: there are only a limited number of ways to connect microcomputers for data transfer, and most of them will have been included in the design of The Gateway.

The Gateway software runs on Apple Macintosh IIcx computers that are connected to the campus computer network through which the library user may access available information services. Currently, The Gateway workstation user may access the University Library's online catalog and 12 CD-ROM databases that are housed in CD-ROM towers and mounted on a LAN. The Gateway software, which includes HyperCard 2.0, MAC/TCP, and MitemView, is installed on each Gateway workstation. The Gateway workstation was designed to function as the catalog workstation with the intent that every public terminal for the OSU Library's online catalog would, in time, be a Gateway workstation. The OSU Library also intends to make The Gateway available for remote users of the online catalog. The content of the narrative, instruction in The Gateway software, and the system design have been developed to migrate easily to other library environments.

The design group decided to begin writing the narrative with the journal section, and when that became operable, attention was turned to the development of the first step of the search strategy—encyclopedias. The intent was to design a common interface to the databases so users would see the same screen design regardless of the database they were using. The *Academic American Encyclopedia* was added to The Gateway, which also now offered the journal section.

The first step in the search strategy is finding background information on the topic, for which an encyclopedia is usually the best source. Using a dictionary for definitions of unknown words and terms is the next step, with searches of journals usually a third step, depending on the topic. The additional steps of the search strategy were added until all were operable.

When the technology to link the CD-ROM versions of the encyclopedia, dictionary, and indexes was perfected, The Gateway incorporated that format into its instruction. The Gateway continued to add indexes in electronic format as they became available. The decision, however, on what to instruct the students to use was not decided

by what was available in electronic format but by what was deemed the best choice to meet the students' needs. The Gateway is designed to make the best use of technology but not to be driven by it. Links from the microcomputers to the catalog and CD-ROMs were completed near the end of the second year.

IMPLEMENTATION OF THE GATEWAY

As of May 11, 1989, a Macintosh workstation with The Gateway prototype was set up in the main library for library personnel to use and evaluate. For security reasons, the workstation was located in the administrative wing, and librarians and staff were encouraged to schedule a time or simply to stop by to use it. Evaluation forms were available at the terminal.

Based on the evaluation data, the journal section was revised, and a number of subjects and indexes were added to this section. This development was supervised by Nancy O'Hanlon, head of the Reference Department at the Undergraduate Library, who was on temporary assignment to the project. She brought to the project considerable knowledge of how undergraduates seek information and what is needed. Her appointment ran from March through June 1989, and she did an excellent job of pulling the narrative and the staff ideas together, adding consistency to the screen design, and expanding the journal search and other sections of the narrative. Testing and evaluation involving 10 randomly selected students were conducted by the Center for Teaching Excellence evaluation personnel in May. Based on the evaluations, The Gateway was revised and the narrative was expanded. Considerable time was spent on how to determine and analyze user needs. As a help in accomplishing that goal, as well as to provide baseline data, a user study was conducted in the 1988 fall quarter.

The highest priority of the project's programmers was to program and implement the instructional design ideas of the library staff and others. Thus far, programming had been done using a high-level language. Programming using an authoring system that allowed easier and faster development was preferable, but a graphics-based authoring system with the required communications features had not been found. The search for tools that would allow easier implementation and modification of design ideas continued.

At the end of two and one-half years, the narrative had been developed from the original journal search into five major areas of information: Facilities, Explain, Strategies, Sources, and LCS (online catalog). The Gateway provided a subject approach to encyclopedias and journal indexes, recommending which materials students should

use depending on their information needs. The Gateway also answered simple questions about the library system, e.g., library locations, floor plans, and services.

By early 1990, connectivity between The Gateway, CD-ROM materials, and LCS had been achieved. This meant that from a single Gateway workstation, the user could access the *Academic American Encyclopedia* on CD-ROM, the catalog, periodical indexes, and the needed guidance to make decisions about what to use and where the information was. A prototype LAN was set up with five workstations sharing a line to the library's online catalog system and databases on CD-ROM. Project goals were seamless access to the CD-ROM database from within The Gateway program. This was a real breakthrough for the project in both instruction and technology.

The Gateway has met the needs of many students and programs. One specific program can be cited as an example of improved library instruction with The Gateway. The Young Scholars Program was implemented by the university in 1988 and is designed to prepare minority students for college. Beginning with a class of pre-seventh graders the first year, the program brings to campus for two weeks 400 students at each grade level. They are taught subject matter and certain skills including information-seeking skills. The first year of the library's involvement with the program was 1990, and the library instruction was ineffective. In 1991, a special limited edition of The Gateway was prepared for the class of tenth graders to use in completing an assignment on Martin Luther King. Students did their work in a computer lab, and evaluations showed that use of The Gateway was very successful. Students liked it and appeared to learn from it. Without The Gateway, the library would have had a difficult time creating and implementing a meaningful library assignment that was also popular with students.

EVALUATION OF THE GATEWAY

Evaluation results provide evidence of how The Gateway has benefited students and improved library services. In 1988-1989, copies of proposed narrative sections were periodically distributed to library and faculty and staff who had expressed an interest in critiquing them. About 30 copies were distributed, and a wide variety of responses were received. These provided some of the material Nancy O'Hanlon used in the development of the search strategy narrative.

The project has been continuously evaluated, primarily through written evaluation forms left at the workstations. The first evaluation study, which is a summative evaluation, was done in fall 1988 when baseline data were collected on how students found information in the

library using traditional methods. This will be compared with how students use *The Gateway*, and the results of both methods will be examined. This comparative analysis has not yet been done. The other evaluations have been formative ones, and the results have been used to revise and expand the narrative. In mid-1989, the first public workstation was set up, and library staff evaluated *The Gateway* using forms that asked about screen design, logic of the narrative, and the content. In addition, 11 students were intensively interviewed using *The Gateway* in fall 1989.

When the first public workstation became available in the main library in January 1990, evaluation forms were placed next to the terminal. These forms were similar to the staff evaluation forms. In mid-1990, two freshman classes of 41 students were required to use *The Gateway* for an assignment. Evaluations were very positive. The evaluation form was changed considerably in mid-July of 1990 and has remained much the same since. After the CD-ROM access became available on *The Gateway* in mid-February 1991, satisfaction and usage both increased.

The Gateway was also evaluated by special classes—a graduate class and two industrial design classes. Their comments were not summative but formative, i.e., how to improve *The Gateway*. The Center for Teaching Excellence provided an industrial design expert to evaluate *The Gateway* in January 1990. In spring 1990, a library science class evaluated *The Gateway*.

The Gateway was designed for use by lower level undergraduates with the intention of increasing its complexity and sophistication in materials to meet the needs of advanced undergraduate and graduate students and ultimately faculty. Evaluations showed that upper level students, faculty, and staff used *The Gateway* and were successful in their searches. Of 1,190 evaluation forms turned in voluntarily at the workstations from July 16, 1990, to July 31, 1991, the breakdown by academic level of user was as follows: freshman, 106 (9%); sophomore, 127 (11%); junior, 170 (14%); senior, 226 (19%); graduate students, 306 (26%); faculty and staff, 77 (6%); other, 102 (9%); no answer, 72 (6%). In summary, 629 or 53% of the users were undergraduates, 306 (26%) were graduate students, and a total of 935 students made up 79% of *The Gateway* usage during that period.

Nine *Gateway to Information* workstations help students to identify their information needs and locate, evaluate, and select the information. *The Gateway's* success rate in accomplishing this is documented in the results of the project's evaluations. Results of 1,656 evaluation forms dated from July 16, 1990, to January 31, 1992, indicated that 78% were "completely" or "mostly" successful in their searches: 89% rated the screens "very" or "mostly" clear. Ease of use of *The Gateway* was rated

“very” or “mostly” easy by 84%. From 964 of those evaluations, 83% said they would use The Gateway again.

Sample topics searched included reflexology, women in politics, waste water pollution, medieval period dress and costumes, gum chewing/bubble gum, reunification of Germany, and social welfare. Comments were varied but mostly very positive. Some examples included the following: “Easy as pie.” “This thing takes your hand and leads you right down the path.” “This was incredible! What a time saver.” “I could see exactly what I was doing, and I knew my status all the time.” “Everything you could want is at your fingertips!” “I’m addicted: great visual format.” “Really easy to use—please get more of these.”

Design issues were settled by evaluation results when possible, and the impact of evaluation can be seen in Figure 2. The improvement in the evaluation results can be directly attributed to the revisions that were made based on the evaluations. Figure 3 shows two screens in the Gateway’s early development. These were opening screens on The Gateway before it was made available to the public when it was still being evaluated by library staff only. The first screen showed type of material—books or journals—and was too limiting in its options. The second screen attempted to anticipate the user’s needs and was also too limiting: users were unable to identify with the options. Neither approach worked well. Opening screens of The Gateway now offer a research strategy diagram that works well (Figure 4): the screen provides the users with several options and allows them to better control their searching.

The evaluation studies revealed some basic tenets. One was that most students will not read more than two lines: they prefer to skim text. Another was that students usually select the first or second choice, especially when using the system for the first time. As they become accustomed to using the system, this tendency diminishes. Most users did not understand the meaning of icons or how to use them. This lack of knowledge extends to arrows, but they do understand boxes.

THE FUTURE OF THE GATEWAY

The Gateway will continue to undergo expansion in its narrative and number of available databases and workstations. Immediate plans include continued revision of the narrative based on evaluations and the addition of special subject sections. The first one of these sections is on communication and is being tested by students. A business section

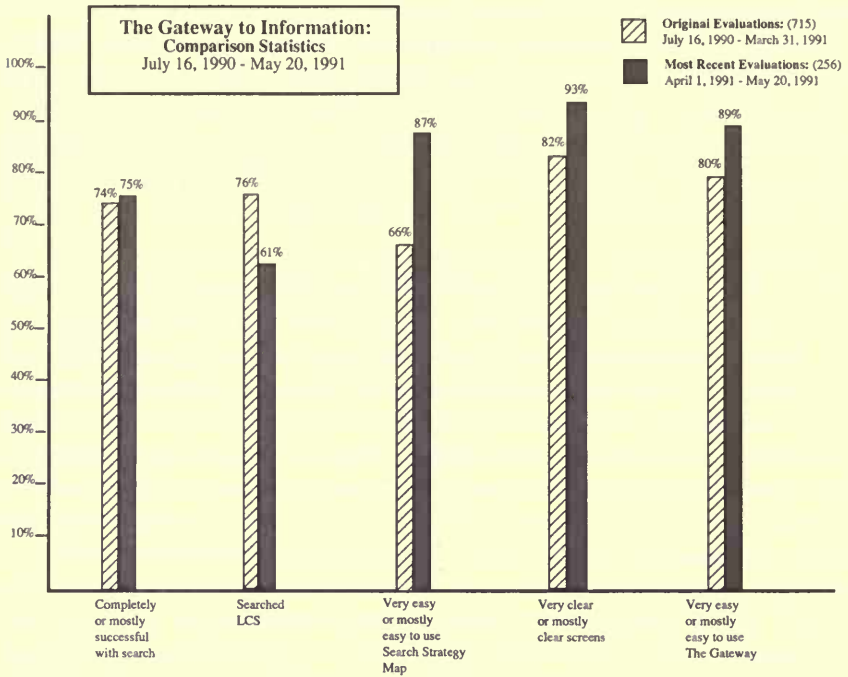



Figure 2. Evaluation results of revisions made on The Gateway

will soon be ready, and by fall 1992, a section of women's studies will be available. These additions will be tested by users and revised until they are as user friendly as the existing Gateway narrative. Commercial databases will be added to The Gateway as money becomes available.

Replacement of public online catalog terminals began in spring 1992, and 20 new workstations with Gateway capability will be available by the end of May. The library will continue this replacement activity until all 106 public workstations have Gateway capability. All of these activities—narrative revision and expansion and addition of databases—will be ongoing. The project will never be finished: it is a forever project. It was envisioned that way, and its development has substantiated that vision.

Plans are already underway to expand the subject list of 100 topics to one based on the Library of Congress Subject Headings classification. The Gateway now recommends specific materials for each subject, and the enhanced list of subjects with recommended sources will expand The Gateway's ability to guide users to the best information. Some have suggested that The Gateway ultimately be programmed to respond

Subject - You have a topic and you want to know what has been written about it. 




Select one of the following sources:


Magazines/Journals ✖

Books ✖


Both ✖


Not Sure


  


If you're not sure where to begin your search for information, start by analyzing your information need. 

Which of the following best represents the ultimate use of the information you seek?

 A paper

 A bibliography

 A speech

 Other purpose




  

Figure 3. Two screens used in early versions of The Gateway

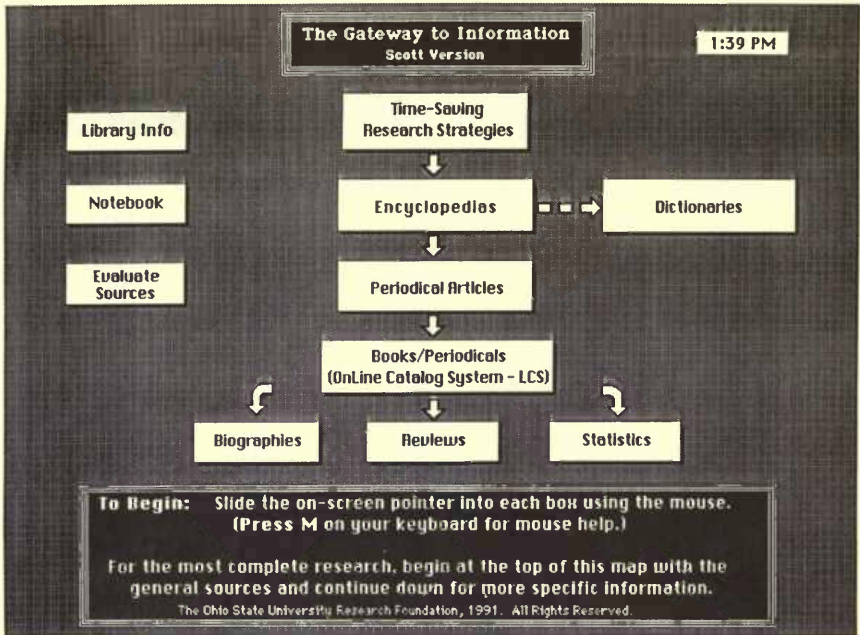


Figure 4. Opening screen used in later versions of The Gateway

to the user's selected subject with not only which materials to use but pages, subject headings used, etc. Some say the cost of doing this would be prohibitive, and from a librarian's viewpoint, it doesn't teach information skills: it's the vending machine approach. However, it is a concept worth exploring.

In The Gateway's immediate future is the development of a UNIX-based system. This would provide remote access and make The Gateway compatible with any type of computer. The narrative would probably not be as appealing as the Macintosh version, but the use of windows would permit the use of some graphics. It is hoped to have this version ready next year, but obtaining money to buy the equipment and do the programming will determine the timetable.

Formative evaluation will continue to provide the basis on which The Gateway narrative is revised and expanded. It would be valuable to do a summative evaluation to determine what impact The Gateway has on students' information seeking. Do they find more or less material using The Gateway than with traditional searching? Is the information found more or less appropriate for their needs? How does The Gateway affect students' attitudes?

In terms of physical expansion, The Gateway will be available on 59 terminals in the library system by summer 1992. This is more than half of the number of public terminals in the library system. The remaining 47 terminals will be replaced within the next year making The Gateway available in all OSU libraries. When the UNIX version is finished, The Gateway will be available across campus in dormitories and offices and off-campus for OSU users who have access to computers. This will be a very popular move; it is one our students have consistently asked for from The Gateway's inception.

The OSU Library plans to share The Gateway with other academic institutions and school and public libraries. The complication is the Library's inability to support such sharing, having neither the necessary staff nor the resources. There have been ongoing talks with several companies about marketing The Gateway. And although there is some interest in a collaborative effort, there is nothing definite to date. Many other academic libraries have expressed an interest in acquiring The Gateway for their institutions. The leaders of a statewide project to link all Ohio primary and secondary schools electronically are interested in incorporating The Gateway into their project. Public libraries have expressed a desire to collaborate on a Gateway version for public libraries. Envisioned is an information system that teaches and guides students from primary through secondary and postsecondary institutions to the public libraries on how to find, evaluate, and select information. The system based on the search strategy concept will make students information literate. In fact, students will learn the search strategy so well that they will be able, ultimately, to apply the concept in libraries without Gateway terminals.

The Gateway to Information is already a success with users, and its potential for development and expansion is virtually limitless. User satisfaction and usage are very encouraging, and The Gateway has demonstrated that it can change how libraries are used. Although no other institution has the right to use The Gateway, there is promise of and an interest in transporting it to other institutions. OSU is committed to sharing The Gateway and to encouraging its adoption by as many other institutions as possible.

Evan Farber, the preminent expert on bibliographic instruction in the world and one of The Gateway consultants, summarized the project this way:

I was so pleased with the progress you all have made with Gateway. As I told you I said to the LOEX group, I felt proud to be associated with the project. It's very impressive, and I think academic librarians are going to feel indebted to you for many, many years. To be sure, others will build on it, improve it, but the credit for developing the first really effective computer-assisted bibliographic instruction program will belong to you. Congratulations—and thanks so much for permitting me to take part in it. (E. Farber, personal communication, May 28, 1991)