Educating the Online Catalog User: A Model Evaluation Study

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AN ISSUE WHICH IS central to planning for the implementation of online catalog systems in libraries of all types, but which received little notice in the literature of the early 1980s on online catalogs, is that of the role of public services staff in the management planning process.[1] Because much of the hard work in the early implementation stages was on the technical and technical services side (especially for libraries bringing up systems which had not been previously field tested), it was perhaps natural that reference librarians and other public services personnel were not counted among those most responsible for bringing forward the technology in libraries. Now more than midway through a decade of tremendous change in libraries, however, it is clear that the public service aspects of online catalog implementation are of considerable interest to the field and that reference librarians everywhere are seeking to forge new roles for themselves.

As public services librarians have sought to define their relationship to the online catalog, it has been natural for them to view the relationship in terms of their role vis-à-vis the older card file technology that online technology supplants. The historic relationship cast the public services librarian as "interpreter" of the catalog—i.e., assisting users to locate items and teaching them how to use the card catalog by themselves. It has long been unclear how much such "interpretation" the card catalog required, though it was long recognized that consistent

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and clear management of the catalog on the technical services side relieved the burden considerably on the reference side in this regard. With the bibliographic instruction movement having gained considerable force and influence on the field within the past fifteen years, the concept of catalog "interpretation" has come to be understood as mandating instruction, at least in academic libraries.

Do online catalogs require instruction in their use and, if so, how is that instruction best delivered? These questions do not have simple answers, yet from the early online catalog implementations at the beginning of the decade library managers have taken positions that assumed a rather simple "yes" or "no" to the first question.

To approach answers to the two questions of whether the online catalog requires instruction and what might be the best means of delivering it, Northwestern University Library undertook a research study, supported by the Council on Library Resources (CLR), to test the value of online catalog user education. In the pages that follow, the research undertaken at Northwestern will be summarized as to the research objectives, the rationale for the study, a description of the methodology and findings, and the study's major conclusions. Though the research brings new findings to the specific question of how best to provide users with services that will enable them to make best use of an online catalog, our work also addresses some larger questions:

1. What is the role of the reference librarian vis-à-vis a catalog that is now considered to be self-interpreting?
2. What do our experiences with online catalog user education lead us to expect in the way of changes in our bibliographic instruction programs overall?
3. What is the future of reference services in an increasingly automated library?

It is hoped that these issues can continue to be seriously addressed as more and more libraries move from an initial "presentation" phase to an ongoing operational phase in online catalog implementation.

The article begins with an overview of the primary objectives of the "Educating the Online Catalog User" project. These objectives are described in the context of Northwestern's setting, with a brief description of LUIS (Library User Information Service), the online catalog component of NOTIS (Northwestern Online Total Integrated System). Following this is a discussion of some of the underlying issues that prompted our interest in online catalog user education. The issues that surfaced in establishing broad learning objectives—the framework upon which the model program was based—are described, and a de-

scription of the NOTIS transaction log facility—an important data gathering tool in the research—is provided. Finally, the article closes by proposing that reference librarians and managers expand the scope of their online catalog user education efforts to include more than the teaching of a single tool. They should take advantage of the brief historical opportunity presented by the online catalog to use the novelty it provides as a vehicle for teaching users about other information retrieval systems that are becoming increasingly visible both within and beyond the library environment.

The overall purpose of the "Educating the Online Catalog User" study was to provide a model for the development and evaluation of an online public access catalog user education program that could be employed by other academic libraries with any number of different online catalogs. The model was developed by collaborative effort among the reference staff at Northwestern and librarians at the University of Wisconsin—Madison and Washington University in St. Louis. Though the project was centered at Northwestern, public services staff at these other institutions provided advice and feedback at several stages of the project in order to keep the research as broadly focused as possible. The experimental stage of the study was conducted exclusively at Northwestern University.

The study had four objectives: (1) to develop a set of systematic and formalized instructional objectives for teaching online catalog use that could be adopted by other academic libraries seeking to develop an online catalog instruction program; (2) to implement an instructional program based on those learning objectives at Northwestern University; (3) to evaluate the success of this program through a variety of established evaluative techniques including the use of transaction log data; and (4) to assess the viability of transaction log monitoring as a data source for bibliographic instruction evaluation.

It was recognized at the outset that the study's objectives were constrained by the features of the online catalog to which the researchers had the most complete access. Northwestern University Library uses the LUIS online catalog, which has a number of features common to many other such systems but also lacks certain features that present significant instructional challenges. LUIS offers title, author, and subject searching but at the time of the study did not provide keyword searching or the ability to use Boolean operators. A number of descriptions of LUIS exist in the published literature on online catalogs,[2] and LUIS is now available (under various names) in over sixty libraries—academic, public, school, and special—in the United States and Canada.

Online Catalog User Education Issues

The central question that directed this study, "What might be the components of a model program to instruct users of an online catalog?" challenges a commonly held view within the field of librarianship and information science. This view is that an effective "user friendly" interactive computer system—such as an online catalog—should not require instruction at all. While such a view is not universally held, it is common especially among system developers and others who are steeped in the use of computers in libraries and elsewhere. A frequently articulated design specification for end user oriented systems is that all system use instruction should be provided as part of its interface—through such things as introductory help screens, user prompts, and labeling conventions—and should be all that even the most naive user needs to know to be able to effectively use that system. A corollary of this view is that efforts to develop an instructional program for the online catalog suggest that the catalog is not fulfilling its purpose and that its design is flawed. With this logic, any effort to provide instruction in online catalog use by public services staffs might be viewed as wasted effort at the least, and provide implicit criticism of the designers as well.

Though the project from its inception questioned this view of the incompatibility of "user friendly" online systems and instruction programs, it did not simply embrace the contrary view that formalized instruction must be given to all online catalog users. Interactive systems for the general public are simply too new and untested for us to assume either of these positions without a period of considerable experimentation and practical examination of what works and what doesn't work for our users. A certain amount of curiosity, fascination, or mystique naturally accompanies technological evolution. At this early stage of online catalog implementation, learning from the practical experiences of others, as well as from more formal research findings, is essential if we are to move beyond these phases in our program development.

Baker and Nielsen[3] review much of the early literature on the debate about the value of online catalog user education, pointing out particularly the sampling bias in the widely cited CLR Online Public Access Catalog (OPAC) studies,[4] a bias which caused users who experienced difficulties in using online catalogs to be underrepresented in the findings. We became interested in creating a model program for educating online catalog users for a variety of reasons:

1. There was (and is) wide recognition that the perfect online catalog simply does not (yet) exist.

2. There was (and is) a perception by many librarians that the online user interface may not accommodate all user needs at present and may never do so.
3. "User friendly" systems are not indeed friendly to all, judging from the experiences of many reference librarians who have worked with users trying to master such systems.
4. The pace of change in interface improvements can seem painfully slow once any online catalog system "works" in the sense that it meets managerial (not necessarily user) criteria for "satisficing."
5. A general training program that conveyed information retrieval concepts might aid users as they moved on to other automated systems both within and beyond the library setting.
6. The numerous online catalog instructional programs that had been initiated in various settings—particularly in academic libraries—suggested that making an effort for consistency in instructional planning was worthwhile and beneficial.

Learning Objectives

In order for a model online catalog user education program to be applicable to a variety of institutions and for the program to be formally evaluated, it was critical to the Northwestern project that program learning objectives be stated and generalized beyond those associated with a particular system. The first step in the execution of this research project involved formalizing a set of such objectives which would serve as the basis for teaching the use of an online catalog. Much of the conceptual work related to this aspect of the project is described by Baker.[5]

In planning the framework of instructional objectives, there was extensive discussion with librarians at each of the participating libraries. These discussions centered on identifying a set of ideal objectives (or goals of instruction) without linking them to features of specific systems or tying them to specific methods of instruction. With the goal of developing a generic instruction program with generalizable objectives, it was essential to look at online catalog instruction as it could be applied across many systems. By focusing on such general expectations of online catalog users, we felt that skills might be more easily transferred across systems.

What to Teach: Concepts or Procedures

In determining an appropriate direction for our online catalog teaching, two concerns were raised. The first involved what technical aspects of the system's structure should be presented to users; the second questioned the manner in which such aspects should be included in the learning activity. With one of our project objectives being to work toward developing transferability of skills learned about one automated system to skills needed for another, an emphasis on teaching concepts and structure, rather than procedures, was endorsed. In addition to increasing the likelihood for transferability of skills, teaching system structure is useful for conceptualizing the workings of a system. When the way a system works is not transparent to the user, there is little opportunity for self-diagnosis of errors or decision-making for search strategy development.

This instructional approach has been supported by other research in the ways humans interact with computers. Works by Christine Borgman, Ramsey and Grimes, and others[6] discuss the importance of conceptual models in teaching interactive systems and the resulting mental model the user has available for error diagnosis and problem solving. Such conceptual models are often built around metaphors and often illustrate techniques designed to communicate an overall context for system behavior to the learner.

Learning occurs whether it is structured in a systematic program or whether it is coincidental. Coincidental learning of a system through the use of prompts and help screens may actually prove to be an effective means for learning procedures. Focusing an instructional program around conceptual models does not by any means diminish the necessity for a user to have a functional understanding geared toward learning system-specific searching techniques. These techniques may actually be more easily acquired from instruction embedded in the system once the conceptual model has been learned. One of the most important functions of the user interface for online catalogs has been to provide this task-oriented training. With so many automated systems being used in libraries around the country, transferring skills learned about one system to another may prove quite difficult. Designing instruction around a conceptual *v.* procedural framework may provide ultimate transferability of learning in the use of online catalogs.

Evaluating the Model

Because the objectives developed for online catalog instruction involved acquisition of both cognitive and behavioral learning, it was

important to develop an evaluation strategy that addressed objective achievement of a group of representative users at solving both cognitive and behavioral problems. Both pencil-and-paper responses and observation of "hands-on" online catalog activity were deemed critical to assess the project.

Another issue important to the study was that of cumulative learning. Because the library patron often learns the use of research tools in stages (such as by trial use followed by assistance from a librarian), cumulative learning, or learning that builds on previous learning, frequently occurs. In the case of learning to use a library catalog, cumulative learning is especially salient: many users are exposed to repeated instruction in the use of the catalog in elementary school; many users rely on experience as the most available (if not most efficient) teacher of library use skills. Bibliographic instruction librarians are aware of the problems inherent in this situation, for they often must help students "unlearn" previously incorrect information concerning the card catalog.

This concern with the effects of cumulative learning led to the development of an experimental design which allowed us to examine and evaluate the effects of two types of bibliographic instruction methods—both individually and combined—taking into account the order of their presentation. The research design protocol called for the creation of two experimental groups (each of which took two tests and participated in two instructional sessions) as well as the use of a control group which only took two tests but received no instruction. The instructional treatments included a classroom-like presentation on the online catalog (what Northwestern has dubbed a "LUIS Workshop"), and the reading of a printed brochure designed to convey instructional content. As the tests themselves required participants to use the online catalog to answer some of the questions, all three groups were exposed to the catalog and its introductory (tutorial) and "help" screens. The two tests were composed of questions designed to test the same knowledge. The control group took the first test followed by a "placebo" presentation (a short noninstructional film) and then the second test. The first experimental group, which we will call Group "A," received the classroom instructional session followed by the first test and then read the instructional brochure and took the second test. The second experimental group, which we will call Group "B," read the brochure and took the first test and then received the instructional session and the second test. Figure 1 provides a graphic representation of this study design. There were thirty subjects in each group.

Time Sequence	Group Treatments		
	Control Group	Experimental Group A	Experimental Group B
Time 1	no instruction	workshop	brochure
Time 2	TEST 1	TEST 1	TEST 1
Time 3	distraction	brochure	workshop
Time 4	TEST 2	TEST 2	TEST 2

Figure 1. Study Design

Sample Selection

A random sample subject population of ninety freshmen students was selected for participation in the study using a sampling technique that insured equal representation by sex and representation by academic

major corresponding as much as possible to national norms derived from American Council on Education data.[7] Only freshmen who had previously participated in LUIS workshops were excluded from participation. As an incentive for the subjects to commit to participation when they were contacted by telephone, each student was offered a free ticket to a commercial movie theater upon completion of the experiment.[8]

Data Collection

The principal means of data collection for the study were a battery of two written tests prepared for the study and transaction data collected by the NOTIS computer as subjects interacted directly with LUIS. The first test consisted of fourteen questions related to background characteristics of the students, forty-five questions tapping knowledge of LUIS—including some which required use of the terminal—and eight attitudinal questions asking how the students liked various features of the catalog. Eight catalog search "practice questions" for which students had to use the terminals were also included. The second test included the same type of questions as the first except for the fourteen initial questions tapping demographic variables. Pretesting of the two tests with twenty randomly selected Northwestern students verified that the tests, though different, were measuring acquisition of the same learning.

Monitoring online catalog transactions as a means of collecting data was accomplished through utilization of NOTIS software developed initially in connection with the CLR-sponsored OPAC studies of 1980-82 in which Northwestern was a Research Libraries Group participant.[9] The room in which the experiment was conducted was equipped with sixteen online catalog terminals, each having adjacent to it a copy of the *Library of Congress Subject Headings*. Subjects were instructed to write on their test booklets the identification number of the terminal at which they were searching for the test but were not told that their transactions were being recorded. This protocol device provided a means of unobtrusive measurement of online catalog use in which transaction data could be associated with user characteristics recorded on the test booklets. This strategy is especially notable as a monitoring technique as it allows exemption from institutional and federal guidelines for research on human subjects—due to the educational testing nature of the experiment—and yet is less obtrusive than other monitoring experimental designs in that subjects are led to assume that pencil-and-paper is the sole method of data collection.

Analysis

Following the completion of the data gathering, the 178 filled-out tests were first paired by student identification number and subsequently coded for machine processing. Eighty-seven usable pairs of tests were so coded and input for processing using the Statistical Package for the Social Sciences (SPSS). Tabulated responses were scored using a key of correct test items, and raw percentage correct scores were computed. Analysis was also accomplished in regard to a number of study questions by grouping the raw percentage scores into "high," "middle," and "low" performance groups. This grouping enabled as well the analysis of student performance considered in terms of degree of achievement of five important learning objectives established in conjunction with the model program developed at Northwestern. A fuller description of the methods used to reduce the data, as well as detailed findings on the effect of demographic variables on performance, are provided in the authors' final report to the Council on Library Resources on the project.[10]

An indicator of overall test performance for each of the three test groups is the average (mean) test score, again expressed as a percentage of questions answered correctly. Table 1 provides a clear picture of group performance by showing the score for each group on both test one and test two. On both tests the performance of the control group was the lowest. Group "A," which received the lecture instruction prior to test one, performed best on test one overall, and their score on test two surprisingly dropped. Group "B," which read the brochure prior to test one, performed less well on the first test, but, following their receiving the live instruction, performed nearly as well on test two as group two had on test one. Analysis of variance tests with the test one and test two data for the mean score by group revealed that the within-group variation on both scores was less than the variation between groups indicating that the different means for each group are statistically significant ($p < .001$).

TABLE 1
AVERAGE TEST SCORE BY GROUP

	Test 1	*Test* 2
Control Group	54.66	53.21
Group "A"	77.5	63.3
Group "B"	61.66	76.94
ANOVA Significance < .001		

These average scores represent overall test performance in only a general way and are presented in this manner as a way to look at the cumulative learning issue that was of interest in the study. Because of the length of the instruction period and the opportunity subjects were given to interact with the instructor, the superior performance of group "A" on test one was expected. Why the "A" group's performance dropped on the second test—following their exposure to the brochure—cannot be adequately explained by the analysis presented here, but we may hypothesize that test fatigue may have been an important factor. Recalling that the "A" group's taking of the second test was nearly ninety minutes into the period set aside for the experiment, and that the intervening period between tests for this group was much shorter than for group "B," it seems highly likely that group "A" was simply tired of responding to questions on the second test. Group "B," while spending as long on the experiment overall as the "A" group, did have a considerably longer intervening period between the two tests.

In the matter of evaluating the achievement of specific learning objectives we were less successful. Although we established a means to analyze the result of the evaluative test in a way that treated the achievement of each objective separately, we must acknowledge that a conceptual dilemma exists. As certain objectives dealt more concretely with the learning of definitions and concepts that were easily tested for, while other objectives—concerned as they were with the execution of procedures—were inherently more difficult to test for, we cannot make clear conclusions regarding different levels of attainment on the test. Different attainment levels may reflect more about the tests themselves than about actual superior performance in online catalog searching. Because our knowledge of online catalog users is still so incomplete, instructional evaluation is made difficult especially in respect to validation of the appropriateness of certain cognitive learning tasks for successful performance in searching. There is some danger in evaluation studies of this sort to direct instruction to successful completion of the test rather than to the achievement of skills that the test has been designed to measure.

With these considerations in mind, an analysis of the data showed that the group that had the workshop first scored significantly higher on procedures such as using equipment than the group that had the brochure. One of the most interesting facts is that the control group scored higher than both of these test groups on procedural knowledge. But in interpreting and structuring searches the workshop group did significantly better. It was followed by the brochure group and then the

control group. In terms of concepts, the control group fell far behind the other two test groups with the workshop group in the lead.

Among our findings on the analysis of the transaction logging was that subjects who had a workshop presentation made fewer errors than those whose first instructional exposure was to the printed brochure.

What do these findings allow us to say about the cumulative effects of two learning experiences with online catalog instruction? Because there is no clear pattern in improvement on all the objectives for any of the three groups it is difficult to say. The order of presentation of the two learning experiences—the brochure and the lecture—did not appear to affect group performance on all five learning objectives in the same way; for some objectives a score increase between test one and test two might have been the result of the lecture having been given first, for other objectives it might have been the brochure being presented first. Further work is in order to refine the analysis and sort out what factors may lead to improved test scores.

Conclusion

Through a close examination of the process of developing learning objectives, creating a program to help meet them, and evaluating the outcome of the program, there are a number of conclusions that we can make. This research has provided some answers to the question which initially motivated the study, "Why teach use of an online catalog?" First of all, it is evident that teaching improves user performance on a written test. The development and use of learning objectives has further helped to define specific competencies which may lead to better online catalog searching. We have further helped define for the field at large those specific competencies that lead to better performance.

Another aspect of our response to the "Why teach the online catalog?" question must be that there are certain concerns that arise with teaching online catalog use at this time. Of primary concern is the necessity to train users on some procedural matters on a case-by-case basis leading to possible difficulties in users' assimilating the information. For example, in any online system there will be details and peculiarities about the library's organization and physical layout which may appear in index displays online. Providing instruction at this level of detail distracts from the overall flow of the presentation and adds only incidental information (in most cases, unless the online system is poorly designed in the first place) which the audience is not likely to remember. Perhaps a greater problem that we are confronted with is the fact that such an explanation reveals idiosyncrasy and inconsistency in the sys-

tem possibly leading to loss of confidence among users that there is an understandable logic to the system that can be mastered. Such a situation tends to defeat the overall instructional goal.

Inconsistencies are numerous in online catalogs. Explanations for these features through printed guides, lectures, online help, or individual assistance may help ease the burden for many users. However, the explanation to a user of one odd feature in one catalog does not prepare him or her for the next feature or the next catalog. As important as making design improvements in online catalogs is at this time it must be recognized that each online catalog will likely continue to present its own set of instructional problems with which public services librarians must somehow struggle.

There were limitations imposed by the study process itself that point to areas of difficulty in the way library public services staffs perceive the challenge of online catalog user education and thus approach program planning. Our experience and training as librarians has led us to view the online catalog and its use in isolation from other information retrieval developments both within and beyond the scope of libraries.[11] Focusing only on online catalog training may result in narrow program planning. In this research project, we developed a model program which demonstrated positive results in subjects' performance on tests of online catalog knowledge. However, there are clear indications that instructional development which embodies objectives for generalized information retrieval may be a more appropriate teaching ideal.

As a new and very important tool, the online catalog is the focus of a great deal of attention from public services staffs, but this concentration of attention should not necessarily lead to building programs around the teaching of a single tool alone. Users are, on the whole, pleased with the online catalog, but for them it is but one tool among many and, more to the point, a means to an end rather than an end in itself.

Our focus in the "Educating the Online Catalog User" project was to develop a model program for online catalog instruction. In seeking a cognitive model or metaphor upon which to base instruction, we used the card catalog because a number of valuable analogies and comparisons could be made. But as we librarians move further in our own thinking about the direction in which online systems are developing, the card catalog analogies may become less and less appropriate or relevant. The advances in computer communications make the acquisition of knowledge about information retrieval, broadly conceived, increasingly valuable for any library user. Many libraries provide public OCLC terminals in addition to an online catalog of local holdings

already in place or planned. Online searching of commercially vended bibliographic files is gradually working its way from behind the reference desk out into the room. As an outcome of the Linked System Project, one may soon expect to provide the searching of remote files directly within the online catalog interface now provided users. As these systems are introduced, we need to be aware of the more complex training needs such systems may require; building upon our online catalog training experience may be a useful way to prepare ourselves, our staffs, and our users. But to do this, our conceptualization of what is most usefully conveyed about the online catalog must be generalized beyond our traditional notions of catalog teaching. The online catalog toward which the teaching would be directed would serve as an example of a particular implementation of general principles but not the only possible implementation. Bringing in another example—such as a general database management system now commonly available even on the microcomputer—would enrich the instruction. Such a training approach would be more challenging to students and have the great advantage of providing information that would be useful in other contexts.

This approach relegates to a secondary status many of the pieces of helpful information that may make a particular online catalog easier to use, but we feel a broader view may gain both better acceptance by patrons in general and better transferability to other systems. Overcoming the sense of insecurity that this situation may bring will perhaps be difficult at first, but as risks are taken, the rewards may reinforce the new approach suggested here.

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