TRAINING END USERS TO SEARCH ONLINE: BASIC SKILLS AND PRACTICAL CONSIDERATIONS

LA FORMATION DES USAGERS A LA RECHERCHE EN ACCES-DIRECT: COMPETENCE DE BASE ET CONSIDERATIONS D'ORDRE PRATIQUE

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ABSTRACT

Online searching proves to be an ability resulting from the acquisition of several skills which are not easily taught. These skills tend to challenge our most engrained thought patterns and language functions. Training for end-users should 1) explain the need for and implications of document surrogation; 2) define the organization of textual material by a controlled vocabulary; 3) describe bibliographic data base structure in terms of "word-storage" and "word-retrieval"; 4) encourage flexibility in synonym and word-variant production through exercises; 5) test search strategy design for potential contextual variety. These skills apply to all bibliographic retrieval systems and may be used to enhance manual searching capability as well.

RESUME

La recherche en accès-direct s'avère une activité qui résulte de l'acquisition d'une compétence complexe et difficile à enseigner. Cette compétence met au défi nos moules-pensées et nos schèmes de langage les plus enracinés. La formation de l'usager devrait 1) expliquer le besoin et les implications de l'analyse et de l'indexation des documents; 2) définir l'organisation des textes par un vocabulaire controlé; 3) décrire la structure de la banque de données bibliographique en termes d' "emmagasinage de mots" et de "repérage de mots"; 4) encourager une flexibilité dans la production des synonymes et des variantes de mots au moyen d'exercices; 5) tester les stratégies de repérage pour une variation contextuelle possible. Cette compétence s'applique à tous les systèmes de repérage bibliographiques et elle peut aussi améliorer la recherche bibliographique manuelle.

TRAINING END USERS TO SEARCH TEXTUAL DATABASES
BASIC SKILLS AND PRACTICAL CONSIDERATIONS

In 1977, Martha Williams first published the following, rather encyclopedic definition of online education:

> "...concerned with the foundations, principles and basic knowledge of information science and other disciplines as they relate to such things as database structures, database management systems, file structures, logic, formulation of search strategies ... vocabulary structures and user needs" (p321)

Without question, this quote, as representative of the literature in our field, implies that online training is aimed at individuals who are already familiar with "foundations of information science". Depending on exactly how lofty you feel those foundations should be, the majority of end users (library patrons, business managers, scientists, researchers who perform their own searching) find themselves at odds with the recent content and delivery of online training seminars.

In any discussion of end user education, we must look at the current state of online affairs to define exactly how online searchers in general are being educated and then proceed to understand how well suited these techniques are to educating end users.

First of all, the nature of what needs to be learned by searchers of textual databases, according to popular phraseology, involves "both sides of the brain"; that is, it calls upon intellectual effort, mechanical repetition and creative intuition (Grande, (1980b). Because the online industry is dynamic, the training process is continuous. Perhaps the three most significant characteristics of contemporary searcher education are: (1) reliance on previous searcher background in bibliography; (2) skills orientation involving "hands on" practice and repetition; and (3) its constant addition of new material which in turn demands more "hands on" investigation and experimentation. These characteristics have been dealt with by the commercial vendors with (1) combination lecture/practice sessions; (2) update seminars and yearly meetings; (3) newsletters; (4) loose-leaf binder handbooks which are easily revised; and lastly, (5) only one or two commercial online systems have investigated a manu-driven, user-friendly interactive structure. (DOSZKOCS, 1980).

These efforts to reach online searchers are still more suited to information specialists or educators who attend regular professional meetings, maintain substantial collections of printed matter and who are accustomed to studying procedures manuals and having these manuals always nearby. The number of end users trained by commercial vendors increases every year and

was estimated in 1979 by one Toronto area vendor to be approximately 11% of the total user population (Grande, (1980a). These individuals, having no library or formal information handling channel available to them for document retrieval, will have more difficulty coping with the intricacies of the bibliographic world. The intention in the following remarks is to examine training procedures to see if they may be modified to provide end users with the best possible introduction without compromising the quality of searching.

An attempt to reach end users must recognize the following points:

1. Online searching forms a small percentage of the overall work activities of end users (even less than that of full time reference or research workers). Even though their familiarity with computer assisted analyses, word processing and other data processing functions in their work may motivate them to acquire online skills, it does not prepare them for textual retrieval. The concepts involved in the creation and distribution of textual databases are not data processing concepts.

2. End users will be less exposed to the constant change within databases/systems and the reasons for those changes.

3. End users cannot organize database knowledge as easily as those who have been using databases in other forms (printed) or who have been involved in a database creation effort (Caruso, 1978).

4. End users may even work in a "library" or "editorial" environment but may yet be uninitiated to the fundamentals of inverted index and the "personality" of the large textual database.

5. End users with a strong subject background may find it difficult transferring knowledge of the printed sources to an online investigative technique.

To date, the problems and pressures of the online training seminar can be summarized as follows:

- The vendor seminar does not allow instruction at all levels of expertise;

- The seminar format, while the vendor may contribute online time, is usually limited to one or two days (Medline offers 4 days);

- Trainees are unable to perceive characteristics of different files during the session;

- Decisions regarding Boolean expressions, nesting, command functions are especially difficult for the novice and noticeably so for those lacking both research and bibliographic background (Caruso, 1978);

- Personality, intuitive powers and creativity which cannot be adequately tested or evaluated during the training session, all impact on serach success (Grande, 1980b; Dolan, 1979; Wanger, 1977).

Regardless of the sort of trainee in question here, there are basic needs which should be addressed when introducing online searching.

The online searcher needs to understand some fundamental activities of electronic publishing which impact on pre-search, search and post-search procedures.

Depending on the level of bibliographic instruction to which the individual has been exposed, some discussion of document surrogation may be required. Document surrogation may include an actual indexing and abstracting exercise which could be followed by charting the path of a given paper from original publication through surrogation, machine-readable storage, conversion and lastly, retrieval. Some understanding of the elaborate publication networks supporting production of databases like Chemical Abstracts, proves essential to keeping the searcher's expectations of retrieval at a reasonable level. Included in thes initial discussions should also be some mention of what constitutes an index term, or thesaurus term, how it behaves in regard to other words in a given document surrogate and how it behaves in the search strategy to restrict recall and enhance precision. Of course, this behaviour cannot be explained until the searcher understands how the "words" extracted from the pertinent parts or "fields" of the document precis are treated within the database as a whole.

An exercise that illustrates this process and that has worked well in my experience is one wherein the trainee extracts each significant word from the text at hand (as shown in Figure 6A) and creates an alphabetical index using the extracted "single words" and controlled vocabulary terms. This exercise accompishes several goals. Firstly, the trainee realizes that controlled index terms are applied according to some scheme and with considerable forethought. Secondly, the trainee may obtain a glimpse of how the search strategy depends on simple word matching rather than machine recognition of inherent or inferred concepts in the document. Thirdly, the trainee perceives which

parts of the record or document surrogate will consistently convey subject information; that is, the trainee sees that the title, index terms and abstract fields will consistently reveal what the original article was "ABOUT" as opposed to the source or author fields which, for example, convey no direct information about content. Fourthly, the trainee begins to paint a "horizontal" portrait of the bibliographic file which allows him/her to visualize separate fields which behave consistently throughout one file or files so that assumptions may be amde about the behaviour of an individual field within the database at large.

The ability for the user to transfer his/her concept of one inverted record to all inverted records constituting a given database represents the beginnings, the foundation upon which one would later construct a schematic of actual database organization. Although this is not crucial for a new trainee and certainly not for the occasional searcher, the notion that there may be consistent differences between what is searchable and what is printable within a bibliographic environment is a fundamental concept of major importance. Jacquelyn Gavryck, who teaches online reference at SUNY (Albany), has agreed that when the trainee understands the database in terms of printable and searchable quantities, a substantial learning threshold has been attained (Gavryck, 1980). Perhaps the best exercise for demonstrating this phenomenon involves the trainee extracting all prepositions and conjunctions from the title and abstract, leaving only the significant words for searching purposes. These remaining words are then arrranged in alphabetical order to mimic the database "Basic Index". Later in the session, the trainee will retrieve that particular title and abstract, display the text during an online print and witness that the previously extracted prepositions, conjunctions and punctuation have been "restored" or "retained" for display purposes but discarded for searching.

These realizations pave the way to certain other "pre-search" activities which together formulate what could be called "Concept Analysis". Generally speaking, a "good searcher zeros in on the problem and can separate essential from extraneous information" (Dolan, 1979). Where the sciences are concerned, this process should be easier for end users than intermediaries but the fact is that many end users have difficulty identifiying extraneous words which function to limit the results of searches too severely. Since many end users lack the database background which most seasoned intermediaries bring to the keyboard, they may formulate strategies which incorporate words that are unnecessary or cumbersome for the system and/or the database.

To combat these tendencies, several rules may be applied in practice sessions:

1. Avoid search terms that match the database name or the central theme of the database. (Thus, one avoids searching the word "sport" in the Sport & Recreation Index file.)

2. If the topic of the search is a chemical or chemical reaction, a process, device or technique and suited to a highly technical database, stick to specifics and use simple strategies.

3. Some databases are more applications-oriented then others. A database created for chemists will discuss chemical reactions within one solar cell of a solar panel whereas an energy database will approach the same subject from a more general angle; for example, the application of solar panels to heating homes.

4. When searching word roots, be sure to give enough of the stem to allow the appropriate variations to be searched without excessive delays in response time due to large numbers of unwanted variations having to be searched.

All of the above rules basically point to identifying a database audience or database specialty and the nomenclature or vocabulary that corresponds to that specialty.

If acquiring knowledge of online command languages automatically conveyed awareness of all descriptive terminology on any subject at all levels of specificity, then I would suggest that we are all in the wrong business! Typically, librarians recognize the need to provide alternative access points or "approach" points and do exactly this when assigning added entries or specifying relationships between terms when building a thesaurus. End users with subject background will more likely approach a research topic with one"packaged" phrase or subject heading that to them feels or sounds familiar and comprehensive. As we have seen, in the design of databases for textual retrieval, grammar has been broken down. The creation of the inverted index itself is an act of removing words from their positions in tidy phrases or meaningful sentences. The fact that most verbalized information needs must be totally redesigned for online interrogation implies that grammar and "packaged" phrases are antagonistic to healthy online strategies. Although mapping of related terms is available within several text retrieval software packages, both private and commercial, the most commonly used commercial bibliographic systems offer only crude relational word structures at best. The searcher must still act as a human thesaurus and be ready to describe the topic at hand exhaustively. The exercise in Figure 10 illustrates concept

definition in terms of identifying alternative access words or "synonyms" and variant word forms.

Closely related to the identification of synonyms is the ability of the new searcher to anticipate possible (probable) content of yet to be retrieved items based on the possible placement of words in the record. To illustrate exactly what can happen, let us look at Figure 11. Most new searchers (with or without information background) find this aspect of searching textual files quite unsettling. Problems of this nature which interfere with relevance or precision in online searching may be minimized by the use of controlled vocabulary, restricting searching to title and index term fields only or by the cautious use of word proximity features. Remember that in scanning bibliographic databases, one should treat the individual search terms like puzzle parts which are deleted and plugged in, regardless of contextual variation. It may be argued that, while extensive use of word proximity produces highly relevant retrievals, it imposes a bias on the system which automatically affects recall negatively. If one expects a given topic to be treated in the literature consistently, then one expects too much. Turning to the controlled vocabulary, keywords may avoid contextual variation but these pre-coordinated access points can rarely anticipate the universe of all possible future information needs nor can the pre-coordinated indexing scheme keep pace with new concepts entering the jargon phase.

We may summarize the pre-search abilities discussed as involving (1) understanding a database for "word storage" and "word retrieval"; (2) the ability to isolate essential concepts and verbalize them succinctly; (3) the ability to think in synonyms; (4) the ability to anticipate variant word forms; (5) the ability to anticipate word order and contextual variation and their impact on meaning.

Let us now look to the more practical functions associated with the mechanics of the actual search. Intermediaries and end users alike often enter the initial seminar at the same level of expertise when it comes to the mechanics of terminal operation, handling a data network, and the simple command functions required for textual retrieval. These more practical skills are those that are most susceptible to change and delegation to machine. For example, it is likely that telecommunications protocol, all those cumbersome network gateway addresses (for public dial ports) will sonn be simplified to pressing a single button. Undoubtedly, other search/print functions will follow.

Traditionally, post search skills or "follow-up" activities have not been stressed with end users unless they have some motive in marketing their searching skills or seeking a subject expertise to substantiate their searching skill.

Examples of post search concerns which lend themselves to classroom discussion would be: (1) the editing, analysis or enhancement of the printed product of the search, the printout; (2) acquisition of indepth database background; (3) arriving at SDI applications; or (4) library management applications. These activities are usually associated with the proper administration of computerized bibliographic services and have understandably been of isolated interest to intermediaries.

Taking all of these points into consideration, the type of instructional program which best suits the needs of end users is one that:

1. involves repetition of tasks at the keyboard;

2. explains document surrogation and the database as a receptacle for document surrogates;

3. exercises word skills;

4. evokes the formulation of database/system models so that new information may be readily absorbed and ranked by the new searcher.

From this list of characteristics, it becomes evident that in the online education process, the actual lecture is only an instalment but that instalment must paint a picture of electronic publishing and elementary database structure. To summarize, I have proposed an outline on which a simple introduction to online bibliographic searching may be based. The exercises which reinforce an understanding of file structure and strategy development are useful for any online searcher, those with or without research experience. In conclusion, I feel that the system specific command languages are bound to disappear, leaving the library patron as free to access the keyboard as his/her T.V. set. In addition, the hassels of telecommunications protocol are short-lived. However, the challenge that language presents in closing the gap between the end user's information need and the universe of documented information will be with us as long as there is more than one way to express an idea.

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FIGURE 1

"...CONCERNED WITH THE FOUNDATIONS, PRINCIPLES AND BASIC KNOWLEDGE OF INFORMATION SCIENCE AND OTHER DISCIPLINES AS THEY RELATE TO SUCH THINGS AS DATABASE STRUCTURES, DATABASE MANAGEMENT SYSTEMS, FILE STRUCTURES, LOGIC, FORMULATION OF SEARCH STRATEGIES ... VOCABULARY STRUCTURES AND USER NEEDS." (WILLIAMS, M. 1977)

FIGURE 2

(1) RELIANCE ON PREVIOUS SEARCHER BACKGROUND IN BIBLIOGRAPHY;

(2) SKILLS ORIENTATION INVOLVING "HANDS ON" PRACTICE AND REPETITION; AND

(3) ITS CONSTANT ADDITION OF NEW MATERIAL WHICH IN TURN DEMANDS MORE "HANDS ON" INVESTIGATION AND EXPERIMENTATION."

FIGURE 3

THESE CHARACTERISTICS HAVE BEEN DEALT WITH BY THE COMMERCIAL VENDORS WITH

(1) COMBINATION LECTURE/PRACTICE SESSIONS;

(2) UPDATED SEMINARS AND YEARLY MEETINGS;

(3) NEWSLETTERS;

(4) LOOSE-LEAF BINDER HANDBOOKS WHICH ARE EASILY REVISED; AND LASTLY,

(5) ONLY ONE OR TWO ONLINE SYSTEMS HAVE INVESTIGATED A MENU-DRIVEN, USER FRIENDLY INTERACTIVE STRUCTURE. (DOSZKOCS, 1980)

FIGURE 4

ANY ATTEMPT TO REACH END USERS MUST RECOGNIZE THE FOLLOWING POINTS:

(1) ONLINE SEARCHING FORMS A SMALL PERCENTAGE OF THE OVERALL WORK ACTIVITIES OF END USERS (EVEN LESS THAN THAT OF FULL TIME REFERENCE OR RESEARCH WORKERS).

(2) END USERS WILL BE LESS EXPOSED TO THE CONSTANT CHANGE WITHIN DATABASES/SYSTEMS AND THE REASONS FOR THOSE CHANGES.

(3) END USERS CANNOT ORGANIZE DATABASE KNOWLEDGE AS EASILY AS THOSE WHO HAVE BEEN USING DATABASES IN OTHER FORMS (PRINTED) OR WHO HAVE BEEN INVOLVED IN A DATABASE CREATION EFFORT (CARUSO, 1978).

(4) END USERS MAY EVEN WORK IN A "LIBRARY" OR "EDITORIAL" ENVIRONMENT BUT MAY YET BE UNINITIATED TO THE FUNDAMENTALS OF INVERTED INDEX AND THE "PERSONALITY" OF THE LARGE TEXTUAL DATABASE.

(5) END USERS WITH A STRONG SUBJECT BACKGROUND MAY FIND IT DIFFICULT TRANSFERRING KNOWLEDGE OF THE PRINTED SOURCES TO AN ONLINE INVESTIGATIVE TECHNIQUE.

FIGURE 5

TO DATE, THE PROBLEMS AND PRESSURES OF THE ONLINE TRAINING SEMINAR CAN BE SUMMARIZED AS FOLLOWS:

- THE VENDOR SEMINAR DOES NOT ALLOW INSTRUCTION AT ALL LEVELS OF EXPERTISE;
- THE SEMINAR FORMAT, WHILE THE VENDOR MAY CONTRIBUTE ONLINE TIME, IS USUALLY LIMITED TO ONE OR TWO DAYS (MEDLINE OFFERS 4 DAYS);
- TRAINEES ARE UNABLE TO PERCEIVE CHARACTERISTICS OF DIFFERENT FILES DURING THE SESSION; (CARUSO, 1978);
- DECISIONS REGARDING BOOLEAN EXPRESSIONS, NESTING, COMMAND FUNCTIONS ARE ESPECIALLY DIFFICULT FOR THE NOVICE (GRANDE, 1980) AND NOTICEABLY SO FOR THOSE LACKING BOTH RESEARCH AND BIBLIOGRAPHIC BACKGROUND (CARUSO, 1980);
- PERSONALITY, INTUITIVE POWERS AND CREATIVITY WHICH CANNOT BE ADEQUATELY TESTED OR EVALUATED DURING THE TRAINING SESSION, ALL IMPACT ON SEARCH SUCCESS (GRANDE, 1980B; DOLAN, 1979; WANGER, 1977).

FIGURE 6


CHEMICAL ABSTRACTS
SUBJECT COVERAGE
AND
ARRANGEMENT OF ABSTRACTS BY SECTIONS
IN
CHEMICAL ABSTRACTS
1975 EDITION
Multi-System Tape

Exercise 2: Singlewording

FIGURE 7

Smell of success

The results of an examination written by 100 students at York University in December were rendered meaningless by the cheating — acknowledged by the university — that went on. The presence of only one supervisor to watch over two rooms full of students was plainly inadequate and it led to a chaotic situation in which textbooks were opened, answers were shouted out, and confusion reigned. It was bad enough that one student walked out in disgust.

What does the university plan to do to make amends? Professor Harold Kaplan, dean of the faculty of arts, says the ideal solution would be to identify the cheaters but, since this is difficult, the university administrators are prepared to offer a make-up examination to those who want to write it.

That's not good enough. It lets the cheaters (who probably don't need a make-up examination) get off scot-free, it generally undermines confidence in the value of examinations, and it is unfair to those who did badly *because* the examination was poorly conducted.

The decent way out is to start at the beginning again. Another examination — this time with at least two monitors, which is surely not asking too much of a university whose full-time faculty at the moment numbers between 1,010 and 1,020.

TI - /SMELL/OF/SUCCESS/

SO - GLOBE & MAIL (G&M), JANUARY 20, 1979

IT - *CHEATING;/*STUDENTS;/UNIVERSITIES;/EXAMINATIONS;/ONTARIO;/HIGHER/EDUCATION;/

AB - CHEATING/RENDERED/THE/RESULTS/OF/100/STUDENTS/EXAMINATIONS/MEANINGLESS/AT/YORK/UNIVERSITY/IN/DECEMBER,/1978,/PROFESSOR/HAROLD/KAPLAN,/DEAN/OF/THE/FACULTY/OF/ARTS,/IS/PREPARED/TO/TAKE/DISCIPLINARY MEASURES WHICH MAY INCLUDE OFFERING A MAKEUP TEST/AND/ASSIGNING ADDITIONAL MONITORS/TO/SUPERVISE EXAM SITUATIONS/IN/THE/FUTURE.

- Title
- Index Terms
- Abstract

arts/BI
Cheating/IT
Cheating/BI
exam
examinations/IT
examinations/BI
Higher/IW
Higher education
ontario/IT
smell/TI
smell/BI
students/IT
students/BI
success/TI
success/BI
universities/IT
universities/BI
University/BI

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TITLE - Smell of Success

INDEX TERMS - _____

_____

ABSTRACT - _____

_____

_____

_____

_____

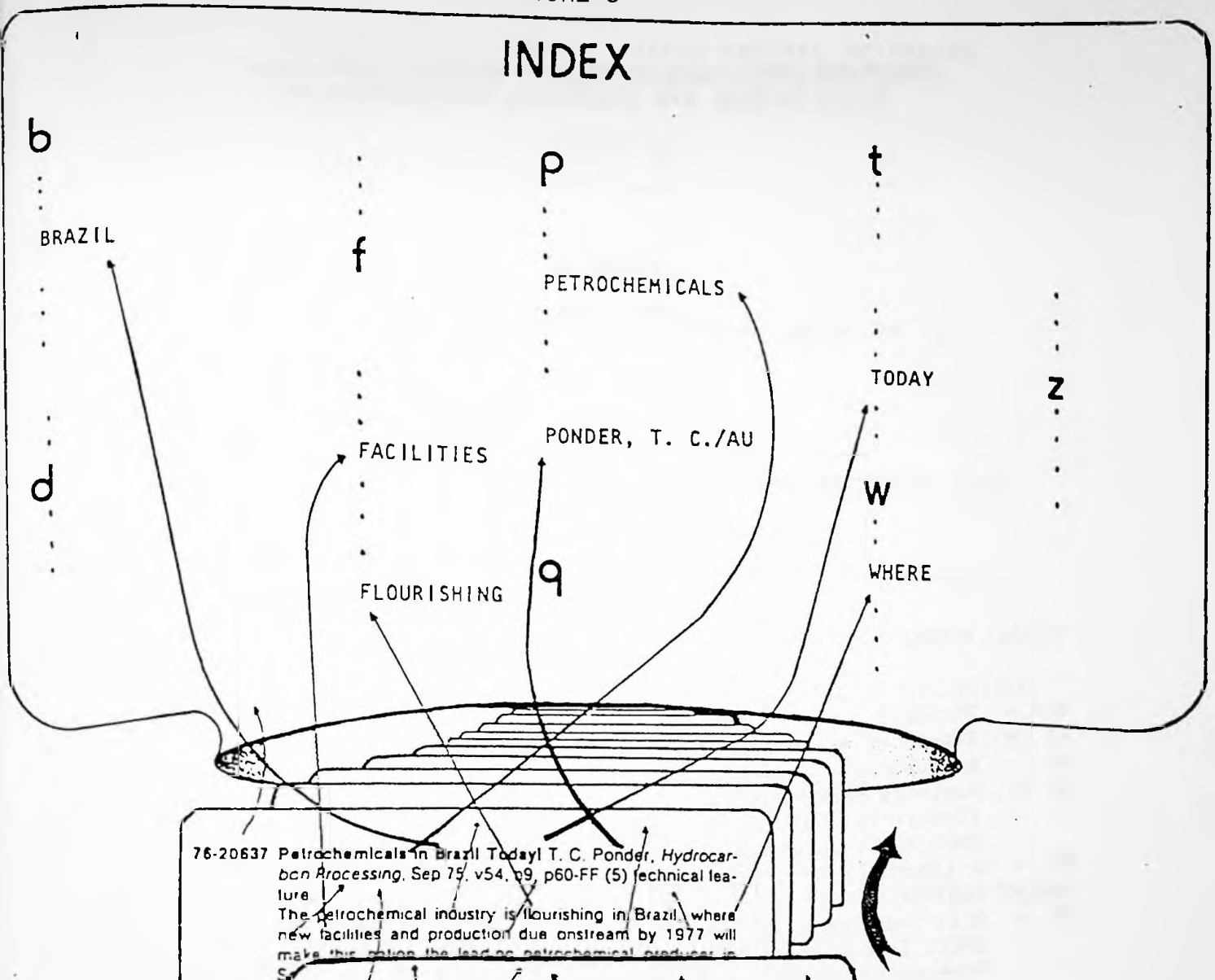
_____

_____

_____

_____

FIGURE 8



76-20637 **Petrochemicals in Brazil Today!** T. C. Ponder, *Hydrocarbon Processing*, Sep 75, v54, n9, p60-FF (5) technical feature
The petrochemical industry is flourishing in Brazil, where new facilities and production due onstream by 1977 will make this nation the lead ng petrochemical producer in

76-20636 **Energy Use and Economics in the Manufacture of Fertilizers**, John L. Sherff, Arthur D. Little, Inc, *presented at Energy, Agriculture and Waste Management Conf, Cornell*, 1975, p433 (9) survey report
The energy content of fertilizers and the effects of energy

76-20635 **Energy and Agricultural Biomass Production and Utilization in Canada**, C G E. Downing, Agriculture Canada, *presented at Energy, Agriculture and Waste Management Conf, Cornell*, 1975, p261 (9) survey report.
Agricultural production, energy inputs, and biomass analysis of Canadian agriculture are described. The direct conversion of biomass through crop products to food of Canadian diet type is only about 40%. Although a considerable amount of original biomass is returned to the soil, appreciable residue and waste is developed at different stages from production to consumption. Biomass is used by animals and produced on land unsuitable for producing food for people, the use of such products through animals is a plus factor and has good potential Energy used off the farm to process and handle the products to satisfy diet needs amounts to almost 3.5 times that used for on the farm production in Canada Areas suited to further evaluation in biomass production and use in Canadian agriculture are included (1 diagram, 4 tables).

FIGURE 9

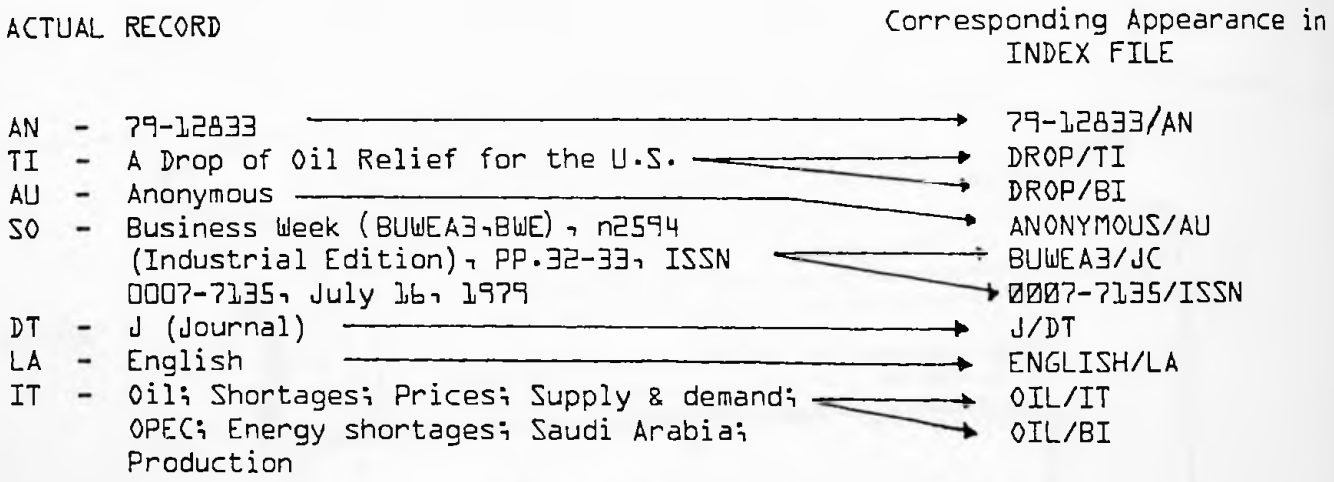

ACTUAL RECORD
Corresponding Appearance in INDEX FILE
AN - 79-12833
79-12833/AN
TI - A Drop of Oil Relief for the U.S.
DROP/TI
AU - Anonymous
DROP/BI
SO - Business Week (BUWEA3,BWE), n2594 (Industrial Edition), PP.32-33, ISSN 0007-7135, July 16, 1979
ANONYMOUS/AU
BUWEA3/JC
0007-7135/ISSN
DT - J (Journal)
J/DT
LA - English
ENGLISH/LA
IT - Oil; Shortages; Prices; Supply & demand; OPEC; Energy shortages; Saudi Arabia; Production
OIL/IT
OIL/BI

FIGURE 10

TO COMBAT THESE TENDENCIES, SEVERAL RULES MAY BE APPLIED IN PRACTICE SESSIONS:

(1) AVOID SEARCH TERMS THAT MATCH THE DATABASE NAME OR THE CENTRAL THEME OF THE DATABASE.

(2) IF THE TOPIC OF THE SEARCH IS A CHEMICAL OR CHEMICAL REACTION, A PROCESS, DEVICE OR TECHNIQUE AND SUITED TO A HIGHLY TECHNICAL DATABASE, STICK TO SPECIFICS AND USE SIMPLE STRATEGIES.

(3) SOME DATABASES ARE MORE APPLICATIONS-ORIENTED THAN OTHERS.

(4) WHEN SEARCHING WORD ROOTS, BE SURE TO GIVE ENOUGH OF THE STEM TO ALLOW THE APPROPRIATE VARIATIONS TO BE SEARCHED.

Exercise 3

FIGURE 11

FLEXIBILITY IN THINKING

' ABILITY TO THINK IN SYNONYMS:

HOME	YOUTH	COLD
House	_____	_____
RESIDENCE	_____	_____
Dwelling	_____	_____
DOMESTIC	_____	_____
_____	_____	_____

' ABILITY TO THINK IN VARIANT WORD-FORMS:

COMPUTER	FLAVOUR	1980
_____	_____	1980s
_____	_____	80
_____	_____	80s
	_____	eighties
	_____	_____

FIGURE 12

PRIVACY AND SECURITY IN

COMPUTER SYSTEMS

COMPUTERIZED SECURITY SYSTEMS

FIGURE 13

(1) UNDERSTANDING A DATABASE FOR "WORD STORAGE" AND "WORD RETRIEVAL";

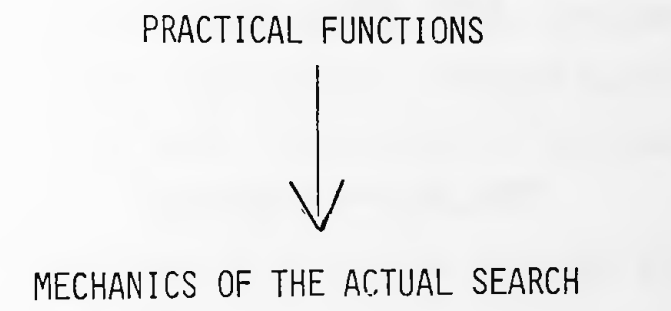
(2) THE ABILITY TO ISOLATE ESSENTIAL CONCEPTS AND VERBALIZE THEM SUCCINCTLY;

(3) THE ABILITY TO THINK IN SYNONYMS;

(4) THE ABILITY TO ANTICIPATE VARIANT WORD FORMS;

(5) THE ABILITY TO ANTICIPATE WORD ORDER AND CONTEXTUAL VARIATION AND THEIR IMPACT ON MEANING.

FIGURE 14



(1) TERMINAL OPERATION

(2) HANDLING DATA NETWORK

(3) COMMAND LANGUAGE

FIGURE 15

POST SEARCH SKILLS

"FOLLOW-UP" ACTIVITIES

(1) EDITING, ANALYSIS OR ENHANCEMENT OF THE PRINTED PRODUCT OF THE SEARCH EITHER VIA MACHINE OR MANUAL MANIPULATION;

(2) ACQUISITION OF INDEPTH DATABASE BACKGROUND;

(3) SDI APPLICATIONS

(4) LIBRARY MANAGEMENT APPLICATIONS

FIGURE 16

TAKING ALL OF THESE POINTS INTO CONSIDERATION, THE TYPE OF INSTRUCTIONAL PROGRAM WHICH BEST SUITS THE NEEDS OF END USERS IS ONE THAT:

(1) INVOLVES REPETITION OF TASKS AT THE KEYBOARD;

(2) EXPLAINS DOCUMENT SURROGATION AND THE DATABASE AS A RECEPTACLE FOR DOCUMENT SURROGATES;

(3) EXERCISES WORD SKILLS;

(4) EVOKES THE FORMULATION OF DATABASE/SYSTEM MODELS SO THAT NEW INFORMATION MAY BE READILY ABSORBED AND RANKED BY THE NEW SEARCHER.