

## Introduction

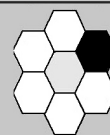
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Information retrieval is a wide, often loosely-defined term, the meaning of which has changed considerably with the expansion of the World Wide Web ('the web') and mass storage devices. Students seeking specific scientific information should look for professional and reliable information not only on the web, but also in the libraries and archives of professional institutions. Therefore in addition to the Internet as a general information source, this Skill Area considers text books, the British Library, online journals, experts in the field and surveys.

Irrespective of the exact means of information retrieval being used, searching for *objective and reliable* information about a specific subject is not easy. Strategies to evaluate information and their source are considered in detail within this Skill Area.

This Skill Area looks at:

- searching for information in text books and scientific journals
- interpreting information - *looks at the objectiveness of text and statistical interpretation*
- evaluating information - *looks at how you can judge the reliability of the information source*
- using the Internet
- using alternative sources for information
- obtaining information from non-written sources e.g. podcasts, video.



## The scientific journal

Relates to Activities: 1.3 Assessing the reliability of information sources and 1.6 Resources and audiences.

A professional scientific journal is a collection of articles aimed at a specific target audience, dealing with a defined community of interest. Scientific journals are very important within the scientific community. They contain summaries and reports of scientific activities resulting from research, ideas and theories. Scientific journals serve as a forum for publishing studies and are an acknowledgement of research activity.

Scientific publications are important in determining the reputations of scientists (“Publish or Perish = POP”), whose advancement depends on the publication of their studies. Many scientific journals are intended for a specific audience interested in a limited field of research. Popular scientific journals are aimed at bringing information about developments and discoveries in science to the general population. The level of scientific writing in these journals is adapted to the target audience.

Examples of professional scientific journals:

*Science*  
*Nature*  
*Proceedings of the Royal Society of London*  
*Proceedings of the National Academy of Sciences*  
*Ecology*  
*Cell*

Examples of popular scientific journals suitable for students:

*Focus*  
*Catalyst*  
*New Scientist*  
*Scientific American*  
*BBC Wildlife Magazine*

Scientific journals are generally collected together in a special section in the library, on shelves arranged alphabetically according to the names of the journals. Individual journals issued over the course of a year are bound together in a hard cover, forming a single volume. These in turn are shelved by the name of the journal and ascending order of date of publication.

With the expansion in the use of electronic communication, scientific journals can also be found on the Internet.

Three different levels of online journals can be found on the Internet:

- 1 A portal that presents the reading public with all the issues of a journal as well as news, other information, announcements etc. Complete articles appear in such an area.
- 2 A website of a journal that displays the contents of all its issues and the complete articles themselves.
- 3 A website of a journal that displays the contents of all its issues, but only makes available abstracts of the articles.

In this Skill Area, students become familiar with several scientific journals both in printed format and on the Internet.

### What do I need to know?

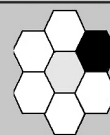
#### Characteristics of scientific journals

##### 1 An efficient tool for distribution of knowledge in the scientific community

In the scientific world rapid distribution of scientific knowledge is important. Scientists need an ongoing update, in real time, of scientific publications. The regular updating in the professional literature of what is being done in science constitutes a crucial aspect of research. The scientific press provides a cheap and relatively speedy means of achieving this.

##### 2 The target audience

The target audience for scientific journals can be either broad or narrow, depending on the nature of the journal. For some scientific journals, all scientists are the target audience and include articles from a range of fields within science. These journals review scientific activity in the forefront of research in the realms of nature and life-sciences, (for example *Science*, *New Scientist* and *Nature*) the primary objective being to keep scientists up to date



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with what is happening across the board.

Other scientific journals are intended for a more limited target audience within specific research areas (such as: *Journal of Microbiological Methods*, *Journal of Cell Biology*, *Molecular Marine Biology* and *Biotechnology*).

Finally there are scientific journals dealing with the teaching of science, targeted at researchers and teachers in science education, for example, *School Science Review* and *Education in Science*.

### 3 The evaluation (referee)

In most scientific journals, every article undergoes a stage of review.

Several scientists with expertise in the field relevant to the subject of the article are asked by the editorial board of the journal to read and judge the article according to criteria of scientific innovation; proof of assumptions made; verification of findings by scientific criteria; relationship to previous research studies; whether it fits the aims and structure of the journal as defined by the editorial board; and the level of writing. It should be noted that the rules for reviewing scientific text books are often different to those for scientific articles.

### 4 Credibility of the publication

Scientific journals are published by reputable bodies, which give credibility to their publications.

### 5 Format of publication

The formats generally used in journals are designed to reduce publication costs (though some carry advertising to defray the cost of production). Since the target audience for scientific journals is usually quite limited, many are distributed on subscription.

Today there is an increasing prevalence of electronic journals, which can save costs and time in many aspects of the production - an article can be published in an electronic scientific journal within 48 hours of receiving it.

Electronic publication has the advantage that it is a 'dynamic' process - readers can easily respond to

the article and corrections and amendments can be made by the authors and their colleagues. On the other hand, problems can arise in safeguarding the intellectual copyright of the authors of articles written in the electronic journal.

### 6 Publication of abstracts of scientific articles

Abstracts save time on the part of the reader, and they can be searched using computerised or printed information pools that assemble abstracts of articles. Collecting abstracts into databases makes the transmission of knowledge and reviewing it more efficient.

#### Finding information in scientific journals

Finding information in scientific journals can be done either manually, or with the aid of a computer.

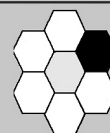
##### Manually

Information can be located by means of indexes published periodically by the journals, often at the end of the last issue of every year, or attached to it.

##### By computer

Computerised indexes are rapidly replacing printed manual indexes. The computerised catalogue has two published forms: on a CD-ROM that requires updating (generally by supplying a replacement disc) or on the Internet, where the frequency of updating depends on the database management policy of the owner of the index.

- Before starting this Skill Area, it is important to establish which scientific journals and periodicals are available in the school / college library so that students will be able to use these journals to research information when preparing assignments.
- Prepare a list of Internet sites of journals concerned with science and technology for the students (and the teachers) which can be searched for articles on specific subjects. If a site does not allow the retrieval of complete articles, the detailed bibliographic particulars can be noted and the article can be searched for in the printed journal in the library.



## The scientific journal

### Comparing professional scientific journals with popular scientific journals

Criteria	Professional scientific journal	Popular scientific journal
Target audience	Those educated in a defined scientific field	People, with no advanced specialism in the area being written about
Field dealt with	Articles dealing mostly in field of defined subject	Deals with a range of subjects
Aim	Serves as a forum for scientists to publish research results, report scientific activity, studies, ideas and theories	A tool for updating readers on innovations in science. To inform and bring people closer to different research fields.
Level of writing	Use of professional terms and complex graphic illustrations	Suited to target audience not familiar with professional terms in the different science fields
Referee before publishing	Every article undergoes a reviewing process and criticism by researchers in the field	Less detailed assessment of the published articles, in some cases only by the editor

#### Evaluating information

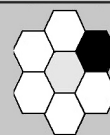
Students are encouraged in Activities 1.4 'Believe it or not' and 1.7 'Questioning information' to use strategies to consider whether information is reliable or not and to be able to justify their decisions.

#### Effective questioning

In Activity 1.5 'Speed survey', students have to find out information from their peers. The key to their research success is choosing effective questions, i.e. questions that are likely to yield informative answers.

#### Effective listening

Activity 1.7 'Questioning Information' and Activity 1.9 'Information for the public' require students to obtain information from non-written material. Developing effective listening skills is a key skill for information retrieval.



## The Internet

Relates to Activities 1.1 The information revolution, 1.2 Using the Internet to find information, 1.3 Assessing the reliability of information sources and 1.9 Information for the public.

This section seeks to develop the skills of information retrieval from computerised databases and to help students understand that in order to achieve good results from searching for information on the web, intelligent and wise use of words and keywords is necessary. The need for critical judgment in searching and classifying is stressed. A familiarity with various computerised databases is assumed which could have been developed in other activities in earlier classes.

### How it all started

The Internet started in the early 1960s during the Cold War. A lot of information about the history of the Internet has been published since then. Take a look at the following links:

<http://www.zakon.org/robert/internet/timeline/>

<http://www.factmonster.com/ipka/A0193167.html>

<http://www.walthowe.com/navnet/history.html>

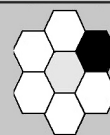
### What do I need to know?

The first activity in this Skill Area examines how the technologies of storing information and of retrieving and processing it have changed over the course of history. The cave wall, papyrus, parchment, and more recently paper all served to spread knowledge and all enjoyed widespread use - each in its own time. However, once written on, these materials could not easily be changed or updated - they preserved the past.

Today, human information is expanding at such a dizzying rate that traditional methods of information storage are no longer adequate. The need to locate and retrieve information quickly has given birth to new technological solutions, particularly the electronic database, which gives the key advantage of being able to change and update information easily and quickly. An electronic database is at the disposal of anyone anywhere in the world through their

### Comparing a printed resource (book, encyclopedia, etc.) and a computerised resource

Criteria	Printed resource	Computerised resource
Search methods	Index, contents, entry	Keywords, strings of words, categories by subject
Limits	Limited physically in opening and ending	No defined limits
Structure of text	Linear reading and graphing	Hypertext
Media	Reading only	Combination of multimedia
Flexibility of text	Reader cannot change text	User can modify the text
Amount of information	Information is limited and filtered	There are two kinds: <b>Open resource</b> - information is unlimited and unfiltered <b>Closed resource</b> - contains sorted and classified information
Access / portability	Easily carried and read	Requires equipment and connections and modest expertise to use these



## The Internet

### Key concepts of the Internet computerised databases

#### Hypertext

A text having dimensions beyond continuous linear text: there are junctions in the text that lead the reader to different reading tracks. The junctions are defined by thinking about different contexts and readers' possible associations, and are adapted to the area of information that the text deals with.

The reader can leave the main reading track and go deeper into a concept / term or sub-topic to which a connection appears and afterwards return to the main reading track.

#### Multimedia

Integrates elements of text, sound, video, graphics and animation into one inclusive work. Information transmitted may be absorbed by all the senses.

Because of the interactivity, the experience of the user is heightened by being actively involved. Interactivity also enables observer control (even if only partial) of the course of the presentation, its content, its duration and sometimes of its results.

#### Disc (CD-ROM)

CD-ROM discs contain 650 megabytes of information: the 'electronic papyrus', as it was called by Bill Gates, is the technology that propels the multimedia industry.

The disc is an example of a closed database: there is no easy way of adding to or updating the knowledge committed to the disc. In order to carry out any change, a completely new edition of the closed resource must be published.

In an open resource, the main example of which is the Internet, information can be updated, added or subtracted at any time. It is one continuous edition.

#### Electronic journal

The concept of a 'periodical' by which an 'issue' is published at regular intervals (weekly, quarterly,

bi-monthly) and contains articles - will either be replaced by another or will change its meaning.

These days there are three common ways in which e-journals are published.

- A computerised copy of the printed issues of the journal, i.e., all the articles and sections that appear in the printed issue of the journal are also published, and appear on the website of that same journal.
- The journal appears electronically only on a specific website on the Internet - there is no printed edition at all. However, on the computer monitor it is presented in a format similar to that of a printed journal.
- An electronic journal that appears only in computerised form but is built as a hypertext with multimedia. The clear boundaries of a printed journal or book (i.e. defined by a front and back binding) are absent in such a journal.

The electronic journal is convenient to use: one can go directly to an article, circumventing the 'cover page' (home page).

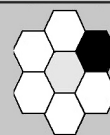
An article in an electronic journal may contain a menu that suggests searching for further material on the subject in another resource in the Internet or may enable access to resources of photographs, sounds, films, etc.

It is also possible to assign a 'Robot'/'Agent' that will gather articles in the Internet that answer to the criteria that have been set. Thus a 'private journal' can be developed.

Various tools have been developed that follow the user and suggest access to new information published on subjects in which he / she showed interest in the past.

#### Computerised databases have the following advantages:

- fast and ongoing update at relatively low cost



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- non-linear continuous reading. The reader can browse and quickly retrieve segments of particular interest. In the course of searching for information, the consumer of information comes across various other ideas that may be worth further investigation
- presents information graphically and using multimedia in addition to text
- interactive
- dynamic and diverse texts: suiting the medium to the unique reader audience, ability to update a document in a short time, filtering and classifying material as needed
- use of multimedia - integrating other media such as photographs, video, audio. Surfing for information is attractive because of the multiplicity of attention it stimulates
- integration of different sources of information which are physically distant from each other. For example, combining documents from computers in different continents, joint writing, integration of other websites

### Difficulties with computerised databases

A search of a computerised database can generate a great deal of information on a particular subject very easily and speedily. However there are difficulties with using computerised databases. One problem is not that of finding the information but of sorting it and assessing its reliability. The combination of easy access of information and lack of ability to evaluate it raises the importance of filtering the information. The surfer must use critical thinking and has to master skills that will enable them to sort the information.

Another known phenomenon is the 'getting lost syndrome' - the experience of losing one's way while searching or surfing the Internet. It occurs because of the many pathways between the links of the hypertext. The searcher sometimes can not retrace their steps to get back to the reading track where he / she began.

However, the most serious problem in the course of searching information on the Internet is exposure to websites that have an acrimonious, violent, pornographic or subversive character. Such sites can pop up without prior warning for the information searcher or be disguised as an innocent site.

Success in using computerised databases must be judged not simply (or even mainly) in terms of generating information, but in terms of the skills in correctly applying that information, organising it so that it can be brought to bear on a particular issue and turning it into knowledge that constitutes a new social, cultural and economical advantage.

Students and adults tend to attribute reliability and authenticity to any and all information printed in books and journals or which appears on the screen of a computer. Today, the consumer is flooded with an avalanche of information from a range of sources. All information needs to be checked carefully to assess its reliability. This is particularly important when considering science and technology subjects, where changes and developments are rapid and up-to-date reliable information is of great importance.

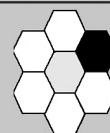
Since information can be published on the Internet without screening or control, it is particularly important to develop and nurture skills of judgment and criticism among students who use internet resources.

Students should address questions such as:

- who is writing the information?
- what body or organisation is behind the site?
- when was the site last updated?
- what is the information on the site based upon?

In addition, it is important students are not carried away by the initial look of a site. They must check whether:

- the visuals are relevant - do they add to the content



## The Internet

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- the site loads easily and refreshes itself quickly
- it is well organised, with a clear structure
- it is easy to navigate the site.

### Searching the Internet

Rules for intelligent Internet information search include:

- define the aims of the search
- define the required contexts
- choose an appropriate search engine
- define keywords / strings of words for the search
- check the relevance of websites that appear at the head of the list of sites found. If the website is irrelevant, refine the search
- use critical reasoning to judge the reliability / credibility of the sites
- if the search does not yield the desired information, conduct it again from the beginning using other keywords / strings of words. For example, the Latin name of an animal or plant; year; adding words such as research, education.