



MODULE 1

INFORMATION & DATA LITERACY

Assessing information needs

Expert Level Activities



Responding to information needs and proposing personal search strategies

DESCRIPTION OF THE ACTIVITY

People often design their scientific achievements gaining insights from their own strategies. So, let's "reverse engineer" the way Google's search engine works to gain insight on how we can improve our personal search strategy.

How do search engines work? The Google paradigm

<https://youtu.be/0eKVizvYSUQ> (How Google Search Works)

(Optional – Additional resource) <https://www.google.com/search/howsearchworks>

Activity: Try to answer the following questions (worksheet) while watching the video (sample answers provided to some questions)

- What is the "index" that is referred to in the video? (0:35)

- What is the purpose of Google's ranking algorithms for the results in your query? (0:50)
- *Tries to understand what are you looking for (1:10)*
- *Tries to sort the most relevant pages on top (1:20)*
- Factors that the algorithms use to decide what to put in the first page. (1:30)
- *Pages that contain the word you are looking for (1:40)*
- *Locations of the word in the page matters (1:45)*
- *Linking between relative pages (1:55)*
- *Location where the query takes place (2:05)*
- *Date of page's publication (2:20)*

- Are all pages on the web helpful and harmless and what Google tries to do with them? (2:30)

- What are the ways that help Google decide for potential changes in search results? (3:50)
- *Ask the users or so-called evaluators (4:00)*
- *Use responses from raters (4:20)*



Developing Research Strategies

Self-Reflection

As you work through your own research quests, it is very important to be **self-reflective**:

- What do you really need to find?
- Do you need to learn more about the general subject before you can identify the focus of your search?
- How thoroughly did you develop your search strategy?
- Did you spend enough time finding the best tools to search?
- What is going really well, so well that you'll want to remember to do it in the future?

Selecting Search Tools

Part of your planning to do research is determining which **search tools** will be the best ones to use. This applies whether you are doing scholarly research or trying to answer a question in your everyday life, such as what would be the best place to go on vacation.

“Search tools” for your source of information could be

- a person
- a web search engine
- a specialized database
- an association
- endless possibilities...use your imagination

Often people automatically search Google first, regardless of what they are looking for. Choosing the wrong search tool may just waste your time and provide only mediocre information, whereas other sources might provide really spot-on information quickly, too. So, make an informed choice about which tools to use for a specific need.

So, how do you identify search tools?

Let's begin with a first-rate method.

- For school research (steps that you can discuss with your students):
 - Talking with a **librarian** or a **teacher** is a great start. They will direct you to those specialized tools that will provide access to what you need.
 - Check your **school's library website** to see what guidance is provided. There will often be subject-related guides or lists of the best resources to assist your research.
- For non-academic material, consider
 - Who cares about this type of information?
 - Who works with it?
 - Who produces it or disseminates it?

For example:

Weather information for the next three days in Athens

 - <https://meteo.gr> - Attica - Athens Centre
 - Don't go to a library (in person or online) or a research database search.
 - Think the same way for other occasions

Are you looking for anecdotal information on old railroads?

 - Find out if there is an organization of railroad buffs, or
 - Search on the web for this kind of information



Consider Asking an Expert

Have you thought about using people, not just inanimate sources, as a way to obtain information? This might be particularly appropriate if you are working on an emerging topic or a topic with local connections.

Determining Search Concepts and Keywords

Once you’ve selected some good resources for your topic, and possibly talked with an expert, it is time to move on to identify words you will use to search for information on your topic in various databases and search engines. This is sometimes referred to as “building a search query”.

- Break down your topic into its main concepts.
- Don’t enter an entire sentence, or a full question.
- Use the key concepts involved with your topic.
- Think of synonyms or related terms for each concept.

The following worksheet is an example of a process you can use to come up with search terms. It illustrates how you might think about the topic of violence in high schools. Notice that this exact phrase is not what will be used for the search. Rather, it is a starting point for identifying the terms that will eventually be used. Notice that the two concepts produce two columns of alternative terms that are joined together.

> **TOPIC:** Violence in high schools

> **CONCEPTS:**

<p>Violence</p> <div style="background-color: white; color: black; padding: 2px; margin-bottom: 2px;">violence</div> <p style="text-align: center; font-size: small; color: gray;">OR</p> <div style="background-color: white; color: black; padding: 2px; margin-bottom: 2px;">bullying</div> <p style="text-align: center; font-size: small; color: gray;">OR</p> <div style="background-color: white; color: black; padding: 2px; margin-bottom: 2px;">guns</div> <p style="text-align: center; font-size: small; color: gray;">OR</p> <div style="background-color: white; color: black; padding: 2px; margin-bottom: 2px;">knives</div> <p style="text-align: center; font-size: small; color: gray;">OR</p> <div style="background-color: white; color: black; padding: 2px; margin-bottom: 2px;">gangs</div>	&	<p>High School</p> <div style="background-color: white; color: black; padding: 2px; margin-bottom: 2px;">high school</div> <p style="text-align: center; font-size: small; color: gray;">OR</p> <div style="background-color: white; color: black; padding: 2px; margin-bottom: 2px;">secondary school</div> <p style="text-align: center; font-size: small; color: gray;">OR</p> <div style="background-color: white; color: black; padding: 2px; margin-bottom: 2px;">12th grade</div> <p style="text-align: center; font-size: small; color: gray;">OR</p> <div style="background-color: white; color: black; padding: 2px; margin-bottom: 2px; height: 15px;"></div> <p style="text-align: center; font-size: small; color: gray;">OR</p> <div style="background-color: white; color: black; padding: 2px; margin-bottom: 2px; height: 15px;"></div>
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Source: <https://courses.lumenlearning.com/informationliteracy/chapter/plan-developing-research-strategies>



Group or Atomic Activity in classroom or home

Now, use a clean copy of the same worksheet to think about a topic of your concern. How might you divide your topic into concepts and then search terms? Keep in mind that the number of concepts will depend on what you are searching for. Also, the search terms may be synonyms or narrower terms. Occasionally, you may be searching for something very specific, and in those cases, you may need to use broader terms as well. Jot down your ideas then compare what you have written with others (e.g. your classmates). Spot where you could use alternative useful terms. Compare your results for the search query.

NOTE: the number of columns depends on the number of concepts.

Boolean Operators

Once you have the concepts you want to search, you need to think about how you will enter them into the search box. Often, but not always, Boolean operators will help you. You may be familiar with Boolean operators. They provide a way to link terms. Boolean operators first met in the previous paragraph where you used AND to join the two columns and OR for using alternative terms in each concept/column.

Study the [Boolean operators - Database Search Tips - LibGuides at MIT Libraries](https://libguides.mit.edu/c.php?g=175963&p=1158594) which is a good overview of Boolean operators (<https://libguides.mit.edu/c.php?g=175963&p=1158594>)

Use the Boolean operators in UPPER CASE (AND, OR, NOT) because this is the way search engines distinguish them from a search term.

Examples – click each link to see the results in Google Search

- [\[puppy AND kitten\]](#) or just [\[puppy kitten\]](#)
 - The AND operator is implied in Google Search Engine if no Boolean operator is used.
- [\[puppy OR kitten\]](#)
- [\[puppy NOT kitten\]](#) or the alternative [\[puppy -kitten\]](#)
 - It generally works better to use the "-" symbol instead of the "NOT" operator. Be sure that there is **no space** between the - and the word you are eliminating

Try the following searches in different search engines and compare the quantity and quality of the results

- women painters AND women artists
- women painters OR women artists
- women AND (painters OR artists)



Search syntax guidelines for different search engines

- <https://help.duckduckgo.com/duckduckgo-help-pages/results/syntax>
 - [puppy OR kitten] or alternative [\[puppy kitten\]](#) (here the default is OR if no Boolean operators are applied between the search terms)
- [Advanced search options \(microsoft.com\)](#)
- <https://support.google.com/websearch>

Truncation

Truncation, also called stemming, is a technique that broadens your **search** to include various word endings and spellings. To use **truncation**, enter the root of a word and put the **truncation** symbol at the end. The database/search engine will return results that include any ending of that root word.

<https://libguides.mit.edu/c.php?g=175963&p=1158679> (Database Search Tips: Truncation)

Try the following

- woman painter*
- female* artist*
- adolescen* (retrieves adolescent, adolescents, or adolescence)

Can you observe the use of the truncation symbol?

Phrase Searches

Phrase searches are particularly useful when searching the web. If you put the exact phrase you want to search in quotation marks, you will only get items with those words as a phrase and not items where the words appear separately in a document, website, or other resource. Your results will usually be fewer, although surprisingly, this is not always the case.

Try these two searches in the search engine of your choice:

“essay exam”

essay exam

Was there a difference in the quality and quantity of results? If you would like to find out if the database or search engine you are using allows phrase searching and the conventions for doing so, search the help section.

Advanced Searches

Advanced searching allows you to refine your search query and prompts you for ways to do this. Advanced search screens show you many of the options available to you to refine your search, and, therefore, get more manageable numbers of better items. Many web search engines include advanced search screens.



Exercise: Google Searches

Go to the [advanced search option in Google](#).

Take a look at the options Google provides to refine your search. Compare this to the basic Google search box. You will notice that many of the search strategies mentioned earlier appear as options in the advance search, such as:

- exact word or phrase
- “none of these words” the same as NOT or “-“
- “any of these words” like the Boolean operator OR

But of course, there are more choices for filtering and limiting your results

- to a particular domain or site, e.g. .edu, .eu, ntua.gr etc.
 - try also using the “site” keyword in a simple search, as “*state members site:eu*” or “*admission process site:imperial.ac.uk*”
- to a specific region or language
- to items you can reuse legally through “usage rights” option
- by file format, e.g. .pdf, .docx etc.
 - try also using the “filetype” keyword in a simple search, for example “*iliad filetype:pdf*”
- by Safe Search in order to exclude sexually explicit content.

Try some of the previous examples and how they can be written through Google Advanced Search.

- women painters AND women artists
- women painters OR women artists
- women AND (painters OR artists)
- puppy NOT kitten

Filter them by country, date, region and notice the returned results in each case.

Bing Search Engine

You can do some filtering in the Bing Search Engine. Advanced searches in Bing are possible mainly through certain operators and keywords. Check the arrows in the Figure above for filtering options in Bing search engine.

Advanced search keywords

<https://help.bing.microsoft.com/#apex/bing/en-US/10001/-1>

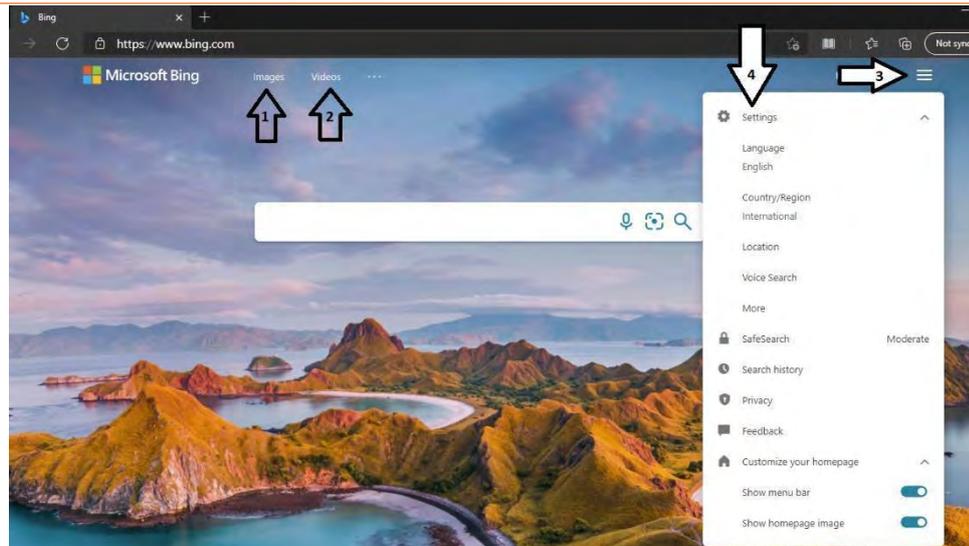


Figure 3: Bing Search Engine

Extension Exercise:

[AGoogleADay.com](https://www.google.com/a/day/) is a daily search challenge from Google. The questions are generally constructed to help practice keyword choice, and develop a skill for breaking a larger question into smaller pieces and determining the proper order to approach them in order to successfully discover an answer.

(Optional) Additional material with tricks and tips

What matters in my search query?

- Every word matters.
Try searching for *[who]*, *[a who]* and *[the who]*
- Order matters.
Try searching for *[red carpet]* and *[carpet red]*
- Capitalization does not matter.
Try searching for *[barack obama]* and *[Barack Obama]*
- Punctuation often does matter but not always.
 - Try searching for *[red, delicious% apple?]* and *[red delicious apple]*
 - There are some exceptions! \$ C# C++ Google+
 - It matters for: € % * - / "" and more...
- Spelling obviously matters, but usually search engines help with that



Figure 4: Google shortcuts for searching or other utilities

OTHER SEARCH STRATEGIES

Strategy:	What you do:
Alternative phrasing	Explore related terms or synonyms to describe an idea.
Plan-to-learn	Search to gain background knowledge and clarify search terms using such tactics as reading search results for new search terms, and using stepping stone resources to get background knowledge and inspire inquiry.
Comparing multiple sources	Use tactics including looking at changes in tone among different sources, contrasting “facts” to assess accuracy, and considering the purpose and audience of different sources.
Chaining	Determine that a question can only be answered by gaining different pieces of information through a multi-step process, and planning the order in which to carry out each step to arrive at a successful outcome.
Specialization	Use a small piece of knowledge—only part of the whole—to discover the whole.
Generation	Employ a broad topic when a specific topic is not findable. Then apply the broad source to solve the specific problem.
Scoping	Recognize what kind of source will answer a question, and search specifically within that category of source.
Validate assumptions	Check that something you believe is actually true by researching it.



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TOOLS DATA & RESOURCES NEEDED

- PC connecting to the Internet
- Web Browser

TIME REQUIRED

- How Google Search Engine works (15 minutes for watching and discussion)
- Spend approximately 5 to 20 minutes for each search strategy depending on its content and requirements.
- Approximate Total Time required: 1.5 hour