

NATIONAL QUALIFICATIONS CURRICULUM SUPPORT

Chemistry

Researching Chemistry: Web-based Research

Student Materials

[HIGHER]



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Web-based research in chemistry

The Researching Chemistry unit of Higher Chemistry will help you to develop the key skills necessary to undertake research in chemistry.

The first step in any research activity involves finding out about a particular topic by carrying out a **literature search**. You will be provided with a brief on a topical issue and will be expected to research the underlying chemistry associated with this issue. The brief will contain a number of **focus questions** related to the topic. You will be expected to provide a clear and accurate answer to one focus question.

This will involve:

- obtaining and recording information from suitable sources relating to a focus question, and
- recording the sources of information selected

To avoid wasting time and resources it is essential that scientists check the literature to find out what is already known about their area of research. Scientists use different methods to communicate their findings. These include:

- writing books
- presenting at conferences
- publishing articles in scientific journals and magazines
- appearing on TV programmes
- publishing their findings on the internet.

You may be able to use books, scientific journals, videos, TV programmes etc, to access the information you need. However, as the internet can provide information within hours of the completion of an experiment or report, websites offer some of the most up-to-date information on new areas of science. The internet also offers free access to a far greater volume of information than is likely to be found in school or college libraries.

Learning objectives

- To evaluate websites for reliability, level and bias when researching in chemistry.
- To reference websites in order to allow another person to find the information you have quoted.

Undertaking web-based research

This material is designed to help you undertake effective web-based research. It is easy to simply look up a single fact on the internet, but harder to know if the information found is accurate and reliable. A few simple ideas will allow you to **evaluate web-based resources to decide how trustworthy they are**.

A good general starting point to examine your **web-based research skills** can be found on the Learning and Teaching Scotland site at <http://www.ltscotland.org.uk/informationliteracy/15to18/choose/CheckYourSources/resources/index.asp>.

- When you are carrying out your research, keep your focus question in mind and try not to get sidetracked.
- Don't write as you go along. Instead, bookmark the sites that are of interest to you and return to them when you have finished surfing. You will probably decide later that some of the sites are of no real use.
- Answer your focus question after you have gathered all the information that you think you require.

In addition to finding and recording reliable information, you must be able to **record your sources** in a way that will allow another person to find the same information. Tips for this can be found on page 13 of this material.

Evaluating

The world wide web allows you to access a huge amount of information. As this is not controlled, however, and anyone can publish almost anything on it, you have to decide if the information that you retrieve is reliable. This activity involves three tasks which address **reliability, level and bias**.

Internet access is required.

How do we know that information that appears on a web page is reliable and accurate? Well, the simple answer is that we don't. However, we can use some key questions to evaluate the accuracy of the sites we find. The checklist on the last page of this booklet will help as you use the internet for research, but the key questions you should ask are:

- **Who wrote the site?**

- Check the address, particularly the domain:

.ac and .edu	educational
.gov	government
.co and .com	commercial
.org	non-profit organisation

- **What is the purpose of the site?**

- Is it to sell something? To inform? To persuade?

- **How current is the site?**

- Check the most recent update.

Task 1: Assessing reliability

Suppose you are investigating greenhouse gases. You want to find out what the main gases are that are thought to contribute to global warming.

- Go online and type 'greenhouse gases' into <http://www.google.co.uk/>.
- Select the Wikipedia and the US-EPA search results:

http://en.wikipedia.org/wiki/Greenhouse_gas

<http://www.epa.gov/climatechange/emissions/index.html>

Within these two sites you will find lists of the principal greenhouse gases, but the lists differ.

- Which source do you think should be the most reliable?
- Which list do you think is accurate?

To resolve this particular problem, continue your search to find other listings of greenhouse gases.

- Is either of the original listings inaccurate?

Task 2: Assessing level

As you carry out research from the web, you will find that sites vary in their complexity. Bearing in mind that you are studying for Higher Chemistry, you need to ensure that the information you use is at the right level.

To illustrate this, suppose you are researching new catalysts and want to find out how catalysts work. Go online and visit the following three sites:

<http://www.science.uwaterloo.ca/~cchieh/cact/applychem/heterocat.html>

<http://www.chemguide.co.uk/physical/basicrates/catalyst.html>

http://www.chem4kids.com/files/react_catalyst.html

The three sites each describe the mechanism of catalysis.

- Which of the three is too complex for your level?
- Which site gives an easily understood definition of catalysts at an appropriate level for a Higher Chemistry candidate?

As a rule, try to source information that is at an appropriate level. Having said this, it is usually better to use more straightforward information than complex data that you don't understand yourself.

Task 3: Assessing bias

Websites are written for a number of different reasons. The information that is presented on the site will depend on the purpose of the site.

The three sites below contain information about a pesticide that contains the active ingredient glyphosate. Go to the sites and consider the purpose of each one.

<http://www.i-sis.org.uk> (search for glyphosate)

http://www.monsanto.com/products/ag_productivity.asp

<http://peopleforfreedom.com> (search for glyphosate)

- Is there a bias to the sites?
- Which site(s) would you consider to be the most scientifically accurate?
- Which type of website would you use to obtain an unbiased report about these pesticides?

In this task you will notice that the appearance of sites can vary considerably, but don't let this affect your opinion too much!

Referencing

In addition to finding and recording reliable information, you must be able to **reference your research**. This simply means that someone else should be able to easily find where you got your information from. Make sure that your answer includes a clear indication of where you have sourced your data. When you reference a website, ensure that you have included the entire URL (address). Try typing it into your web browser to check it works.

Suppose you were researching the impact of the Haber Process on fertiliser development and used the following website:

<http://www.princeton.edu/~hos/mike/texts/readmach/zmaczynski.htm>

This URL contains a symbol that is difficult to copy. Try to open the link below:

<http://www.princeton.edu/~hos/mike/texts/readmach/zmaczynski.htm>

In this case, you are redirected to the correct page. This will not be the case if you have made a spelling or other mistake. For example, try and open the link below:

<http://www.princeton.edu/~hos/mike/texts/readmach/zmazynski.htm>

One small typing error means that you cannot access the page.

Task 4: Putting it all together

Choose one of the following focus questions to generate some web-based research for yourself:

What caused the hole in the ozone layer?

What are the benefits of vitamin C in the diet?

What are the effects of aluminium entering the water supply?

- Find three relevant pieces of information about the topic.
- Reference your sources.
- Present your information to another student.
- Allow another student to check your references and give you feedback on the research you have carried out.

Checklist for evaluating web pages

Author (source)

- Can you find out the name of the author?
- Is there information about the author provided?
- Is it clear that an institution or university or organisation sponsored the website (check the domain)?

Currency (date)

- Is the date the website was put on the internet present?
- Is an update or revision date present?

Level

- Is the website intended for a general or a scientific audience?
- Is the topic explored at a suitable level for Higher Chemistry?

Purpose

- Is the purpose of the site stated (to persuade, inform, explain, sell)?

Bias

- Is the information given and/or the views expressed biased?

Accuracy

- Are the sources of the information listed in a bibliography?

Conclusion

- Using the above information, is this an appropriate source for your research? Justify your opinion.