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The use of search engines in the teaching of 'Classification' in Key Stage 3¹ Science

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As a science teacher who also teaches Year 7 information and communication technology (ICT), I have developed a variety of techniques to integrate science into my ICT teaching and vice versa. Our Year 7 classes are of mixed ability and enthusiastic to complete any work that involves practical activities or ICT. The area of 'Classification' is taught in our Eureka (Chapman et al. 2000) scheme of work within the topic of 'Living things' in Year 7, and contains only a small amount of practical work. Therefore, the use of ICT for pupils to understand the process of classifying invertebrates as well as their identification is both motivating and challenging.

In the topic of 'Living things', the initial lesson looks at the classification of animals into 'vertebrates' or 'invertebrates' and then specialises on the vertebrate groups, of which pupils have a good deal of previous knowledge from Key Stage 2. The second lesson then moves onto the application of their knowledge of classification and classification of the invertebrate groups. This is the lesson that I combine with the use of ICT. My science learning objectives are:

- For pupils to understand that invertebrates can be classified into different groups;
- For pupils to know the invertebrate groups;
- For pupils to be able to describe the characteristics of organisms in each group;
- For pupils to be able to use their knowledge to classify an organism into one of the invertebrate groups.

Literacy objectives can also be included in this lesson, which are:

- For pupils to synthesize information from a variety of sources.

The Key Stage 3 National Curriculum² for ICT states that pupils should be taught 'how to obtain information well matched to purpose by selecting appropriate sources, using and refining search methods and questioning the plausibility and value of the information found'. It is this area of the curriculum that my Classification lesson is based on and ICT aims of the lesson are:

¹ See Glossary

² See Glossary

- For pupils to refine search methods to find appropriate information for the task;
- For pupils to select information appropriate to the task.

After a starter activity recapping the principles of classification and the vertebrate grouping, the main activity is introduced. This is for pupils to produce an A4 fact sheet of information on a given invertebrate group. (This may be completed on Microsoft Word or Publisher depending on the pupil's competency with these applications). Their fact sheets are to include:

- The name of the invertebrate group;
- A picture;
- A description of the features of the invertebrate;
- What the invertebrate eats;
- The habitat of the invertebrate.

These points can be adjusted to differentiate for more/less able pupils; for example all pupils should have the first four points on their fact sheets, some pupils could include the names of different species within the group and a few pupils could look at the way in which the invertebrate is adapted to its environment. Pupils are also told that they will have to explain to the rest of the class what they have found out towards the end of the lesson, so they should bear in mind that the audience for their fact sheets are their peers.

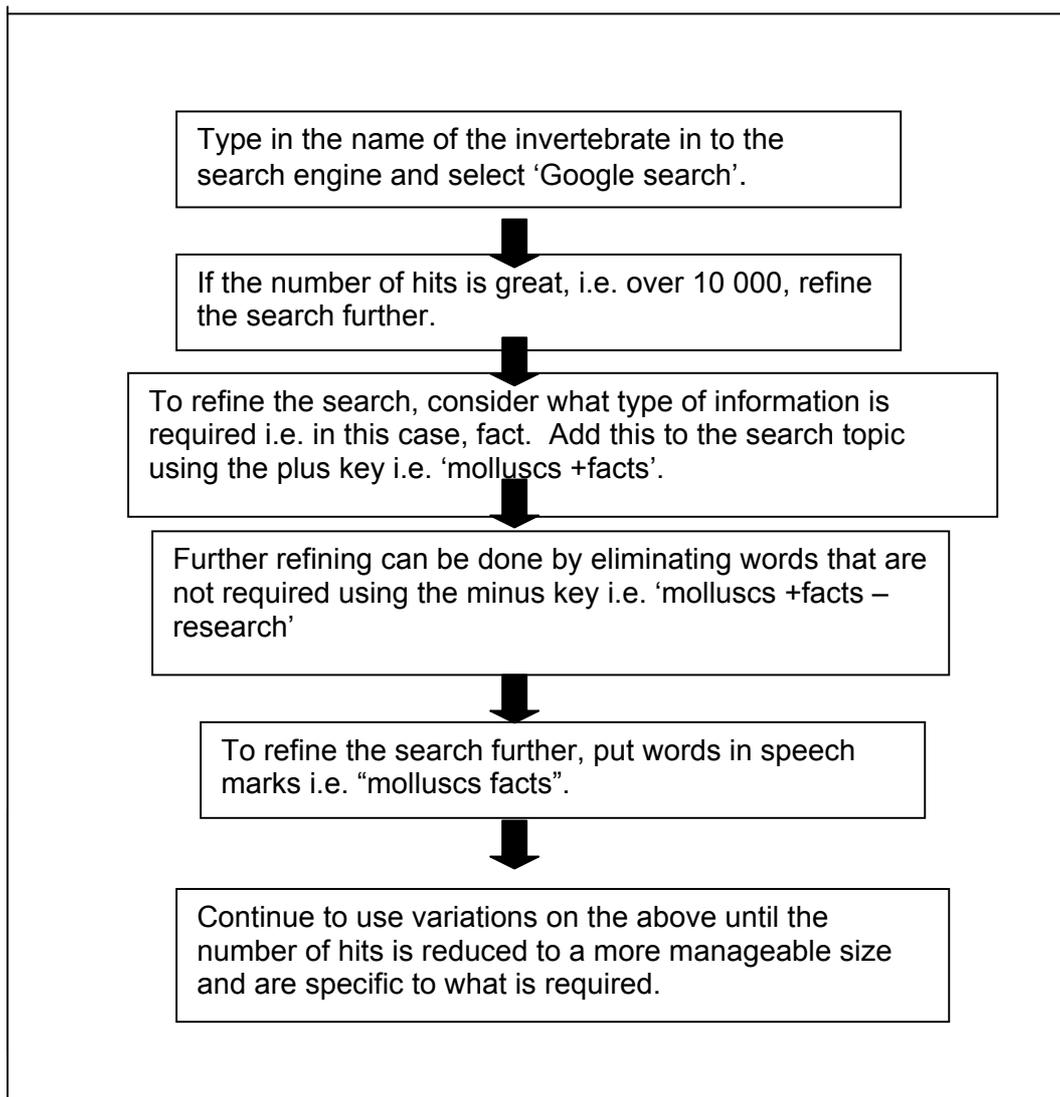
The first ICT teaching point might be to discuss with pupils how to obtain useful information from the Internet. The school homepage is linked to the Google search engine [<http://www.google.co.uk>], so this is one that I recommend that the pupils use. If pupils have recently covered a 'Searching the Internet' lesson within their ICT lessons, or regularly use Internet searches in other subject areas, then little whole-class teaching is necessary at this point. However, if pupils are unfamiliar with the process of refining a search, a more thorough discussion may be required. I find that, even if pupils are competent Internet searchers, it is worth reminding them of some of the strategies for refining searches before they start.

There are various methods for refining searches to find useful information. For the activity in question, refining the search is clearly important due to the amount and variety of information available on invertebrates. For example, pupils studying the group of 'molluscs' might type the word into Google and, during August 2004, would have received 187 000 hits. These hits range from sites on research into molluscs to where they can be visited. A search may be refined by adding more words using the plus (+) sign or omitting words with a minus (–) sign to gain the required type of information. For example, pupils might type in 'molluscs +facts' or 'molluscs +schools' to take the hits down to around 10 700, the top 5 sites which are more appropriate for the task. Also by typing 'molluscs –research', sites on research into

the area are eliminated, again reducing the number of hits. The two methods can then be combined by entering 'molluscs +facts – research', limiting the results further.

Searches can be confined to groups of words by placing words in speech marks, for example "key stage 3". By combining this with the first method, "key stage 3" +"molluscs" may be entered. I found that the best search result was gained by typing in "mollusc facts" which reduced the number of hits right down to six. The first site, [http://www.mcsuk.org/marineworld/molluscs.htm] was exactly the sort of site that the pupils could use to extract the required information. Pupils should be taught to experiment with a range of search methods until they get the required results. They might also need reminding that some search engines are case sensitive, so if 'MOLLUSCS' was typed into such a search engine, only sites with the word in capital letters would be found.

Figure 1.1: Flow chart to show how to carry out and refine a search using the search engine 'Google'.



Pupils should be aware that the hierarchical system Google uses to list the hits from a search is not perfect. The site that the search results list as number one, is not necessarily the best site for the information required. It is also worth discussing with pupils how they know whether a site is useful for the purpose of the task or not. This might be done by a brief comparison of two sites on the same topic to bring out issues such as language used, whether sites are accredited, how recently updated they were etc. Accredited sites may be those written by universities, museums, encyclopaedias etc. and are more likely to contain accurate information. For example the site mentioned above was written by the Marine Conservation society, therefore, the information it contains is known to have come from a good source. Other sites, for example, can be found by the same search method that are written by companies advertising products for sale for aquaria. The information on these sorts of sites may be less accurate as they may have been manipulated for advertisement purposes. Pupils should be aware that anyone can put a site onto the Internet, therefore the information that they are viewing may not be reliable.

Prior to the lesson, it is important to check that sites are available and also to do a quick teacher evaluation of the sites that searches are likely to bring up. The factors that I consider when looking for suitable sites are:

- Overall content – it is obvious by the text and pictures whether the content of the page is of the correct subject matter. For example if 'arachnids' is typed in and the page displayed is an advertisement for the film 'Arachnophobia', it is unlikely that this site will contain the desired information.
- Text to picture ratio – too many pictures is unlikely to yield enough relevant information and too much text is off-putting for pupils and heavy-going;
- Suitability of language – scanning the text often gives an idea of the language but if in doubt, counting the number of words over 7 letters in a sentence usually helps. If there are more than 3 words over 7 letters in a few of the sentences, this usually means that the text is too complex.
- Text font – this needs to be pupil friendly. If it is very small and close together, pupils may find it difficult to read.
- Text layout – large amounts of text on a page is off-putting. Ideally text should be split using subtitles and if different colours are used, this is even better. Coloured text can also help dyslexic pupils who struggle with reading black and white text on a computer screen.

Most of the websites found should have suitable pictures on that pupils can use, however if this is not the case, pictures can be gained by using the 'images' section in Google. This is accessed by the link that says 'images' on the Google website and works by searching the Web for sites that contain pictures of the word or words entered into the

search engine. A thumbnail image of the results is shown on the screen which can then be selected to give larger versions of the image. Again, the same methods can be used for refining the search to gain appropriate pictures for pupils to use. As with text suitability, pupils might need reminding of the type of picture that is most appropriate for their fact sheets; discussions can centre around 'fitness for purpose' of diagram, cartoons or photographs for the task in hand. It is also important to check before the lesson what the pupils' experience is with editing tools. This may be something that you need to go over as a whole class or with just a few individuals, although the 'cut, copy and paste' actions are taught at the beginning of the Year 7 ICT curriculum in our school, therefore most pupils should be confident with their use.

Once time has been given for pupils to carry out their own searches, any groups that have been unable to find suitable sites may be given direction by predetermined sites. If the school has access to the Children's online Britannica, this is a useful site to direct the pupils to. Other excellent sites include [<http://www.enchantedlearning.com/>] and the BBC site, [www.bbc.co.uk]. Directing pupils to these sites means that they can carry out their own searches within the site to find information on their chosen invertebrate. Searching the BBC website for the topic of 'molluscs' should lead pupils to the site: [<http://www.bbc.co.uk/nature/blueplanet/factfiles.shtml>] which is another excellent source of information for pupils to carry out the set task as individual fact files for all invertebrate creatures can be found. Also, searching the Enchanted Learning website in the same way produces the following site: [<http://www.enchantedlearning.com/painting/Mollusks.shtml>] which also has relevant information that pupils can use for their fact sheets.

Once pupils have completed their fact sheets, they can be printed and selected pupils can briefly describe the information that they have found out about their invertebrate. Once all of the invertebrate groups have been described, posters can be displayed somewhere where all pupils can see them and they can be given their final challenge of the lesson. Pupils can be given the name and description of these invertebrates and they have to use the information that is presented to work out which group each of the invertebrates belongs to. This activity can be done as a whole class or in groups depending on the time available. Also the number of invertebrate descriptions given might allow differentiation for groups or could vary depending on time. Either way, this is an excellent way to consolidate the information retrieved.

Teaching the lesson of invertebrate classification in this way is not only motivating for the pupils but it provides useful material for a display that can also act as constant stimuli during the topic, reminding them of the work carried out. Pupils are able to look in more depth at the features of an individual invertebrate, whilst still having a good overview of the characteristics of others. They are also able to apply their knowledge

of classification to an actual situation, improving understanding of the subject.

Glossary of terms

Key Stages

In England, the compulsory years of schooling are divided into 4 Key Stages:

Key Stage 1 (Years 1 and 2):	Ages 5+ to 7
Key Stage 2 (Years 3, 4, 5 and 6):	Ages 7+ to 11
Key Stage 3 (Years 7, 8 and 9):	Ages 11+ to 14
Key Stage 4 (Years 10 and 11):	Ages 14+ to 16

National Curriculum

In England, there is a statutory National Curriculum for all pupils in state maintained schools. The National Curriculum determines the content of what will be taught and sets attainment targets for learning. It also determines how performance will be assessed and reported.

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