# PROBLEM-SOLVING ACTIVITIES: ONLINE RESEARCH MODULES

María José Luzón Marco

University of Zaragoza, Spain

mjluzon@posta.unizar.es

Problem-solving is one of the most important skills that students of scientific and technical disciplines have to develop. Since ESP teaching should be connected with the activities of the disciplines it serves, it is desirable to incorporate problem-solving activities into the ESP curriculum. These activities are based on a constructivist view of learning, from which learning is seen as knowledge construction. With regard to language learning, the constructivist view is that learners understand how language is used and learn to use language by engaging in activities similar to those that they will find in real life and which are related to the context where they intend to use language.

The online activities involving problem-solving which can be used with ESP students are of varying complexity. I will discuss here an activity designed to be completed in four to eight classes by students working in groups: the online research module. Online research modules are problem-solving or decision making activities, in which students use electronic resources (among other resources) to conduct research and find viable solutions to real life problems. The students' task does not just consist in reporting information found on the WWW, but on evaluating information and creating answers.

Ryan Phillips, a designer of online research modules, defines them with the following formula (www.tie.net/train/ryan/researchmodule.html):

Just-In-Time + Networkable + User Specific + Learner Positive + Knowledge Acquisition = Research Modules

The pivotal part of the activity is the essential question or problem to be solved. This should be a real life problem, relevant to the student's target context and with no clear-cut answer. There are three basic types of questions: Why? How? Which is the best? Examples of these questions are the following: Which group has the better legal claim to the Kennewick Man? Which are the most important inventions on planet Earth? Answering these questions requires students to use language to analyse problems, to express cause-effect relations, to form and test hypotheses and draw conclusions, to make predictions and propose solutions, to evaluate and justify decisions. Thus, students practise skills that are a basic part of the ESP syllabus.

Research modules are based upon the "research cycle" created by Dr. Jamie McKenzie. The cycle has the following phases or steps:

1. **Question**. Analyse the problem and list the questions you need to answer in order to solve it. The questions will help the students decide which information to look for.

2. **Plan**. Develop a strategy to find appropriate information: share out responsibilities between group members, select the resources to be used.

3. **Gather**. Collect information which helps to answer the key questions.

4. **Sort, Sift and Analyse**. Analyse the information collected to see if there is enough information to solve the problem.

5. **Synthesise**. Find an answer or solve the problem using the information you have collected and analysed.

6. **Evaluate**. Think about what else is needed.

7. **Report**. Present the work and share it with the rest of the class

A clear description of which each part involves can be found in "The research cycle 2000" (http://www.fno.org/dec99/rcycle.html) and in "Exploring research investigations" (http://www.pacificrim.net/~chinshaw/wwwri/steps.htm). The best way to understand online research modules is to look at an example and see the different parts. See the module "Cave creator" (http://www.gpisd.org/gpisd/modules/midschools/cave_creator/default.htm) or any of the modules listed below.

There are a great number of online research modules on the Web that can be used with ESP students, even though they were not originally intended for ESP students. ESP teachers can also construct their own research modules, focusing on content that is motivating and interesting for their students. See the "Module Maker" (http://questioning.org/module/module.html). The components of an online research module are the following:

- **Background or introduction**. Students are introduced to a real life problem or situation and are usually given one or more Internet links where they can find more information.

- **Question/Task**. The students are given a role in the situation and are asked to complete a task or solve a problem. An example of a task is the following: "Your town will be cut from its current energy supplies for 10 years and the local council is anxious to discover alternate methods. You have been selected to research and report back to the council on alternate energy methods. You are to compare 3 different alternative energy sources and choose one"

- **Product**. A description of the final product the students have to achieve.
- **Timeline**. A description of which tasks should be completed each day.
- **Process and guidelines**. Step-by-step description of what students should do on each visit to the computer. These instructions may include links to related Websites and resources where students can find information to solve the problem. If the online research module does not include links which lead students right to the resources, the activity can be used to help students develop searching skills. In this case the teacher must provide the appropriate guidance.
- **Evaluation**.

As can be seen, one of the defining features, and a great advantage, of online research modules is that they are well-structured and focused activities: teachers provide a timeline of the tasks that students should complete each day. To complete the activity students just need to follow a clearly defined sequence of steps during several sessions at the computer. This helps students not to waste valuable time. Students are guided through the activity and they learn concrete strategies to collect information and create answers.

**Examples of research modules useful for ESP students:**

**Biology**:

-Classifying animals

http://www.cap.nsw.edu.au/bb_site_intro/stage1_Modules/whats_alive/whats_alive.html

-Stem cell research

http://www.bcpl.net/~sullivan/modules/stem_cells/index.html

-Endangered Species

http://www.gpisd.org/gpisd/modules/Highschools/GPHS/GPToad/VisitOne.html

-Aussie Zoo

http://www.cap.nsw.edu.au/bb_site_intro/stage2_Modules/zoo/aussie_zoo.htm

**Law**

-Which group has the better legal claim to the Kennewick Man?

http://www.bham.wednet.edu/online/kwick/bones1.htm

**Medicine**:

-Diseases, Conditions, and Disabilities

http://www.bcpl.net/~sullivan/modules/diseases/index.html

-Antidrug campaign

http://www.bcpl.net/~sullivan/modules/sub_abuse/index.html

-Cloning: Scientific Breakthrough

http://www.gpisd.org/gpisd/modules/midschools/Lee/Visit%20One.html

-Teenage smoking

http://www.cap.nsw.edu.au/bb_site_intro/stage3_Modules/smoking/teenage_smoking.htm

-Nutrition Mission

http://www.howard.k12.md.us/res/resmodm.html

## Engineering

-Inventions

http://www.cap.nsw.edu.au/bb_site_intro/stage2_Modules/inventions/inventions.htm

-The green driving machine

http://www.cap.nsw.edu.au/bb_site_intro/stage3_Modules/green_machine/machine.htm

-Alternate energy

http://www.cap.nsw.edu.au/bb_site_intro/secondary_modules/energy/alternate_energy.htm

-Energy and the Environment

http://www.bcpl.net/~sullivan/modules/energy8/index.html

-Computer Innovations Research Module

http://www.howard.k12.md.us/res/resmodm.html

## Geology

-Cave creator

http://www.gpisd.org/gpisd/modules/midschools/cave_creator/default.htm

## Geography

-Moving? World Geography

http://www.gpisd.org/gpisd/modules/Highschools/GPHS/Country/VISIT1.HTM

-Weather

http://www.howard.k12.md.us/res/rm/chris/weather/default.html

## Business

-Investment

http://www.howard.k12.md.us/res/rm/invest/default.html

-Developing a Small Business Plan

http://www.howard.k12.md.us/res/rm/mktg/default.html

-Stock Market

http://www.howard.k12.md.us/res/rm/stocks/default.html

**Research modules collections**

The following sites contain research modules that may be used for ESP teaching:

-Baltimore County Public Schools' Research Modules

http://www.bcpl.net/~sullivan/modules/index.html

-NSW CAP OnLine Research Modules

http://www.cap.nsw.edu.au/bb_site_intro/bbcap_intro.html

-Grand Prairie Independent Schools District

http://www.gpisd.org/gpisd/modules/modulepage.html

-Howard County Research Modules

http://www.howard.k12.md.us/res/resmod.html

**Information on online research modules**

More information on online research modules can be found on the following sites:

-Making the Net Work for Schools: Online Research Modules (http://www.fno.org/sept97/online.html). Jamie McKenzie, the creator of the Module Maker concept, explains online research modules.

-Module Maker for the Research Module (http://questioning.org/module/module.html)

-BBCAP Online Research Modules

 http://www.cap.nsw.edu.au/bb_site_intro/bbcap_intro.html

-Create your own Online Research Module (http://66.39.15.72/). A template designed to help teachers to plan and produce web-based research lessons.

-How to evaluate Online Research Modules http://www.bcpl.net/~sullivan/web/rmrubric.html

-Resources to develop Online Research Modules

 http://www.k12.hi.us/~paia/research/resources.html

-Curriculum resources: online research modules

http://www.eddept.wa.edu.au/centoff/cmis/eval/curriculum/research/

-The process of building an online lesson

http://www.tie.net/train/marcia/onlinemodules/webquest.htm

- Have IT Your Way with Online Learning http://staffdevelop.org/online.html

-A research module on research modules http://www.tie.net/train/ryan/researchmodule.html

-WWW research investigations investigations http://www.pacificrim.net/~chinshaw/wwwri/

A page to help teachers construct online research lesson:

-Research Module Process http://www.slimbuttes.com/researchmodules/index.html

**Related sites:**

-The WebQuest page (WebQuests are activities similar to research modules) http://edweb.sdsu.edu/webquest/webquest.html

-Engaging Learners in Complex, Authentic Contexts: Instructional Design for the Web www.scu.edu.au/schools/sawd/moconf/mocpapers/moc10.pdf

-Problem-based learning http://www.edcoe.k12.ca.us/tech/pbl.html. Information on problem-based learning and links to online problem-based activities.