Web resources on physics and chemistry hands-on experiments

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Abstract. *The execution of hands-on experiments in the classroom requires and or induces an extensive search for support material that may enable the students to perform their task more easily and efficiently. The search for new ideas or approaches is an almost daily activity of committed teachers. Nowadays the internet is one of the most valuable source of information available. However the search is not always easy and often doubts arise on the reliability of that material. In this communication we will present preliminary results of the work done on this subject. The web based info material built on a few experiments in basic chemistry and physics will be presented.*

Keywords. Internet, Hands-on experiments.

1. Introduction

The pedagogical usefulness and effectiveness of in-class hands-on experimental activities is clearly proved [1] in different school levels and disciplines. The accomplishment of hands-on experiments in a classroom usually requires teachers to perform an extensive search for material. In-classroom hands-on experimental activities should be carefully prepared and tested in order to take the best profit of it. We have to be able to make the tasks executable in an efficient and productive way. Teachers committed to succeed search for new ideas and new approaches in an almost daily basis. Nowadays, it is unquestionable the power of the Internet as a source of information, even though the search is not always easy and often doubts arise on the credibility of the subjects.

2. A brief internet' resources search…

There are many resources available on the internet to help teachers of Physics and Chemistry, both at national and international level. Some covering specific issues and others more general ones, covering topics of basic and utmost importance to Science, as, for instance, what is the scientific method [2]…
Here is a rather short list of links of interest:
http://hop.concord.org/
http://jersey.uoregon.edu/~djohnson/
http://www.exploratorium.edu/snacks/Hands-On_Science/
http://sciconn.mcb.arizona.edu/lessons.html
http://spaceplace.jpl.nasa.gov/index.shtml
http://www-2.cs.cmu.edu/~mwm/sci.html
http://www.physics.brocku.ca/faculty/sternin/teaching/NBSI_workshop.html
http://www.aip.org/isns/reports/2002/034.html
http://www.brainpop.com/science/

In this communication we recommend two of them. The Science Connection website of the Science Outreach program of the University of Arizona, and, NASA' "Space Place" website.

3. Two examples of valuable websites

The website created by the University of Arizona (sciconn.mcb.arizona.edu/lessons.html) under the item "Lesson Plans" covers activities in different levels for several areas like Biology, Earth Science, Math, Chemistry and Physics.

In the Chemistry area, these labs cover basic chemistry concepts such as freezing point, moles as a type of measurement, metals and non-metals,…

As an example, the "chemistry lessons plans" describe experiments on "Learning about Solids and Liquids". These experiments allow students to make their own assumptions about solids and liquids and then test them "just like real scientists!"

The experiment in this web site is described step-by-step and in a very detailed way which might be especially useful for the teachers.

Another activity that is very exciting for students is the "Crime Scene Lab", where students use paper chromatography and fingerprints to solve a simulated crime. The goal of this activity is to teach students the concept of evidence and relate this to data collection as it relates to scientific experiments and also, to introduce the concept that components of a substance can often be separated, as shown here with paper chromatography used to separate components of black ink. The importance of observation (seeing critically) in the making of Science should always be stressed [1].

Despite the fact this website does not contain that many graphical illustrations, it is very interesting in terms of concepts and in the way it is presented.

In fact it is very important that this "support" material and experiments' guides allow induce or even demand the proactive intervention of the students on the definition of the problems in analysis, on the decisions on the way or ways used to explain it, and finally on the critical analysis of the results reached and on the methodology used.

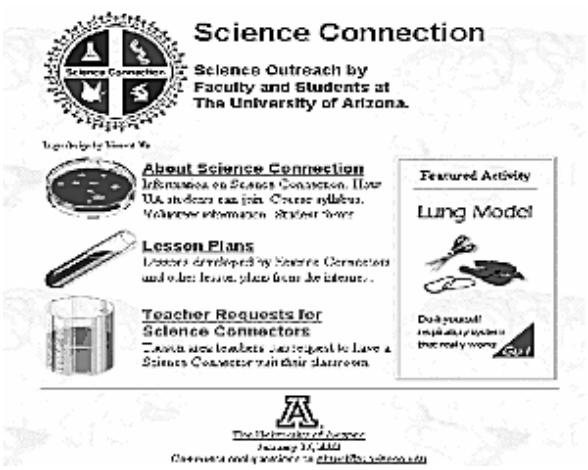

Figure 1. The front page of the Science Outreach, Science Connection of the University of Arizona

In the Physics lesson plans, the importance of Scientific method is stressed for instance in experiments like "Density, Buoyancy and the Scientific Method". Very appealing is for instance the experiment "Making Rainbows from White Light", where students are encouraged to "find" color and light.

Due to the simplicity and funny presentation of the subjects, we also picked NASA's web site: http://spaceplace.jpl.nasa.gov/index.shtml.

This web site is updated in a daily basis and it is available in two languages: English and Spanish.

We found several interesting links on this web site. One of them is to "Games" where word puzzles, scrambled pictures, crazy quizzes and even a board game can be found. This type of activities may allows us to lead the students in a relaxed atmosphere towards more specific pedagogical goals in an efficient way.

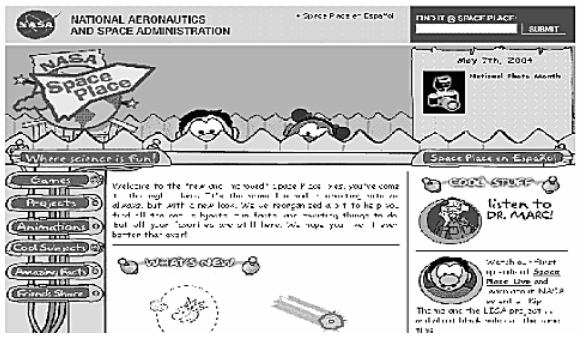

Figure 2. NASA's "Space place" website. An appealing and inspiring site.

We can also go to "Projects" where in a simple but appealing way small projects are presented to us. Projects like for example "Make a Balloon – powered Nanorover" can be accomplished in a classroom in a constructivistic perspective very valuable in pedagogic terms.

Another important feature in such a site is the existence of a search engine that allows us to access information on topics related with Space. It is very important to allow a friendly open way of contact between our young students and renowned specialists.

4. Acknowledgements

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5. References

[1] Manuel F.M. Costa, "The importance of experimentation on teaching the basics of optics at elementary and high schools", Proc. Soc. Photo-Opt. Instrum. Eng., vol. 3190, p. 228-232 (1997).

[2] http://www.brainpop.com/science/scientificinquiry/scientificmethod/bob.weml