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## Interactive Websites: How Do They Align with NCSCOS for Middle School Science?

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### Abstract

To make life a little easier for novice middle school science educators we decided to have our middle school methods students complete an assignment in which they were to locate some educationally valuable interactive web sites that aligned with North Carolina's middle school science standards. Students enrolled in a middle school methods course located various science interactive websites and presented the sites to the class. The students demonstrated how the websites might be used in teaching the science competency objective or science strand. At the conclusion of the presentations, students were given a list of the websites presented and given a brief description of how the site could be used in a middle school setting. There was positive feedback from students after completing the assignment. Many of the in-service students enrolled in the class incorporated many of the web sites into their lessons. This activity is one of many techniques of teaching students how to use technology as a tool as well as providing novice educators with powerful sources of information to share with students and colleagues.

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Finding appropriate Internet sites to share with middle school students can be challenging. The Internet can be characterized as both the world's largest and messiest library. Trying to match websites that meet the needs of students can be a time-consuming and frustrating experience. To make life a little easier for our middle school pre-service and in-service (teachers with a degree seeking to add middle grades science certification or licensure to their existing credentials) science methods students we decided to have our students complete an assignment in which they located useful interactive web sites that aligned with the 2000 North Carolina's middle school science standards. We selected the North Carolina Standards for this activity because of the number of in-service educators enrolled in the course and its alignment with the National Science Education Standards

(National Research Council, 1996).

This article provides a brief listing of a few outstanding science education websites that we believe are well aligned with the 2000 (and proposed 2003) North Carolina Course of Study Science Competency Objectives for grades six, seven, and eight. Because the North Carolina Course of Science Study was designed to align with the National Science Education Standards, the interactive web sites also align with the National Science Standards (National Research Council, 1996). This activity was implemented to provide students practice using the web as an instructional tool as well as provide them with a collection of useful sites that could be used in their own middle grades science classrooms. The Internet is an invaluable resource that brings a treasure trove of useful (often free) resources within a few mouse clicks of the classroom. With this assignment we hoped our students would not only be able to learn how to use this powerful resource more effectively in their classroom, but to use it more often.

The 2000 North Carolina 6-8 Standard Course of Study science standards, which formed the basis of the Internet investigation assignment, consists of four “Strands” applicable to each of the three grade levels and four topical areas of competency goals for each grade level. These strands and content areas are all present in the proposed 2003 North Carolina Standard Course of Study. Additionally, these content standards are consistent with the content standards described in the National Science Education Standards (1996), which organizes the middle grades science curriculum content into eight categories of content strands that apply to grades K-12. These categories include “unifying concepts and processes in science; science as inquiry; physical science; life science; earth and space science; science and technology; science in personal and social perspectives; and history and nature of science” (National Research Council, 1996, p. 104).



The assignment directed the students to select strands and competency objectives from the 2000 North Carolina Science Standard Course of Study and asked them to find good web sites for facilitating middle grades students’ learning of that content. The 21 students enrolled in the methods course were asked to select either a competency objective or strand from the North Carolina Standard Course of Study for science in grades 6-8 and locate interactive web sites using search tools such as Google (2003) and Dogpile (2003). The assignment required students to present the web site to the class and provide feedback on its relevance to the middle school science standards. (See Figure 1 for a sample of the Interactive Website Assignment). Feedback from instructors and peers provided after presentations was the evaluative method used for this assignment. Instructors provided criteria for evaluating web sites for this assignment emphasizing the following considerations:

1. The websites needed to be reputable.

2. The websites needed to be free or at least inexpensive. (Some of the sites found and included in this article were free at the time of the student research and are now fee sites. However, all sites included here are at least available for extended free trial periods.)
3. The sites needed to be highly interactive—as opposed to merely online text.
4. The sites needed to clearly address identifiable curriculum learning objectives.

Specific criteria for evaluating web sites can be found at the North Carolina Department of Instruction website:  
<http://www.ncwiseowl.org/Professional/criteria.htm>.

Below is a list of Internet resources appropriate to teaching the competency goals for grade levels 6-8 consistent with the criteria that was generated through this effort. Following a brief discussion of the goals, the strengths of the discussed Internet applications for promoting learning related to the four curriculum strands and the twelve content areas (four at each grade level) are briefly considered. Descriptions of how each interactive web site might be used to teach middle school science are included in Tables 1, 2, 3, and 4.

### Internet Activities for Grade 6 Competency Objectives

Table 1 presents the identified Internet resources for teaching the 2000 North Carolina Standard Course of Study grade six competency objectives, which are organized into the following categories:

- Lithosphere
- Matter and Energy Flow through Ecosystems
- The Solar System
- Energy Transfer

The two Internet resources we found most useful for teaching in these content areas are Astro-Venture (<http://quest.arc.nasa.gov/projects/astrobiology/astroventure/avhome.html>) and EOA Scientific (<http://www.eoascientific.com/interactive/index.html>). Both sites are highly interactive and engaging.

**Table 1**

<i>2000 NCSCOS</i>	<i>NSES- 6-8 Categories of Content Standards</i>	<i>Web site(s)</i>	<i>Contents</i>
Matter & Energy Flow in an ecosystem	Unifying concepts and processes in science  Science as inquiry  Physical science	<a href="http://www.ftexploring.com/me/me2.html">http://www.ftexploring.com/me/me2.html</a>  <a href="http://library.thinkquest.org/C007506/">http://library.thinkquest.org/C007506/</a>	Energy flow through living organisms & food chains.  Information on ecosystem cycles is presented in various formats including animated graphics in both

	Life science Science and technology History and nature of science		English and Spanish. Site content is organized by themes and by specific ecosystems.
Lithosphere	Earth and space science Science and technology	<a href="http://www.eoascientific.com/interactive/">http://www.eoascientific.com/interactive/</a> <a href="http://www.earthbrowser.com">http://www.earthbrowser.com</a>	Click on earth - virtual earthquake - suited for teens and young adults - intro to earthquake - pinpoint epicenter of a quake - allows students to observe reading; fun game Coriolos effect  Plate tectonics; various earth science topics  Site license \$20. Allows you to view different areas of the earth, volcanoes, earthquakes in real time
Solar System	History and nature of science	<a href="http://quest.arc.nasa.gov/projects/astrobiology/astroventure/avhome.html">http://quest.arc.nasa.gov/projects/astrobiology/astroventure/avhome.html</a> <a href="http://quest.arc.nasa.gov/sso/teachers/">http://quest.arc.nasa.gov/sso/teachers/</a> <a href="http://www.pbs.org/wgbh/nova/tothemoon/puzzlers.html">http://www.pbs.org/wgbh/nova/tothemoon/puzzlers.html</a>	Training sessions  Venture in space (Adventure program)  Index of useful NASA sites  Animated graphics for exploring relative motions of Sun, Earth, and Moon
Energy Transfer	Science in personal and social perspectives	<a href="http://www.adventuresinenergy.org">www.adventuresinenergy.org</a> <a href="http://www.explorelearning.com/index.cfm?method=cResource.dspResourcesForCourse&amp;CourseID=312">http://www.explorelearning.com/index.cfm?method=cResource.dspResourcesForCourse&amp;CourseID=312</a>	Fossil Fuels  Numerous interactive virtual laboratories

### Internet Activities for Grade 7 Competency Objectives

Table 2 presents the identified Internet resources for teaching the 2000 North Carolina Standard Course of Study grade seven competency objectives, which are

organized into the following categories:

- Atmosphere
- Cell Theory
- Genetics/Heredity
- Matter

A particularly useful Internet resource for teaching a difficult subject within these content areas is Cells Alive (<http://www.cellsalive.com>), which provides a wide range of interactive utilities for exploring the structures and functions of cells and organelles.

**Table 2**

<i>2000 NCSCOS</i>	<i>NSES- 6-8 Categories of Content Standards</i>	<i>Web site(s)</i>	<i>Contents</i>
Cell Theory Genetics/ Heredity	Unifying concepts and processes in science  Science as inquiry  Physical science  Life science  Science and technology  History and nature of science	<a href="http://www.cellsalive.com">http://www.cellsalive.com</a>  <a href="http://www.explorellearning.com/index.cfm?method=cResource.dspView&amp;ResourceID=35">http://www.explorellearning.com/index.cfm?method=cResource.dspView&amp;ResourceID=35</a>	Cells; basic structure & functions  Mitosis-interactive process that points various stages of this process  Click on various cells- labels parts; cell cam  Virtual lab for breeding mice and exploring genotypes and phenotypes
Matter		<a href="http://www.pbs.org/wgbh/buildingbig/lab/">http://www.pbs.org/wgbh/buildingbig/lab/</a>	Matter- materials; labs experiments you can do online
Atmosphere	Earth and space science  Science and technology	<i>Weather Channel:</i> <a href="http://www.weatherchannel.com">http://www.weatherchannel.com</a>  <i>Enhanced Satellite View USA:</i> <a href="http://wwwa.accuweather.com/adcbn/sat_index_large.asp?nav=home&amp;">http://wwwa.accuweather.com/adcbn/sat_index_large.asp?nav=home&amp;</a>	Various interactive weather sites for current local,

Unifying concepts and processes in science	<a href="http://www.intellicast.com/Local/USLocalWide.asp?loc=kavl&amp;seg=LocalWeather&amp;prodgrp=RadarImagery&amp;product=RadarLoop&amp;prodnv=none&amp;pid=none">partner=accuweather&amp;loop=1&amp;type=rs</a> <i>North Carolina Radar Loop:</i> <a href="http://www.intellicast.com/Local/USLocalWide.asp?loc=kavl&amp;seg=LocalWeather&amp;prodgrp=RadarImagery&amp;product=RadarLoop&amp;prodnv=none&amp;pid=none">http://www.intellicast.com/Local/USLocalWide.asp?loc=kavl&amp;seg=LocalWeather&amp;prodgrp=RadarImagery&amp;product=RadarLoop&amp;prodnv=none&amp;pid=none</a>	regional, and national weather conditions.
Science as inquiry	<i>Atlantic Satellite Loop:</i> <a href="http://www.weather.com/maps/news/junenonactive/tropicalatlanticsatellite_large_animated.html">http://www.weather.com/maps/news/junenonactive/tropicalatlanticsatellite_large_animated.html</a>	
Science in personal and social perspectives	<i>Satellite Photo Atlantic:</i> <a href="http://www.wwaytv3.com/global/Story.asp?s=348759">http://www.wwaytv3.com/global/Story.asp?s=348759</a>	
History and nature of science		

### Internet Activities for Grade 8 Competency Objectives

Table 3 presents the identified Internet resources for teaching the 2000 North Carolina Standard Course of Study grade eight competency objectives, which are organized into the following categories:

- Hydrosphere
- Population Dynamics
- Evolution
- Motion and forces

Within these content areas, River Run (<http://www.uncwil.edu/riverrun>) and Water on the Web (<http://www.waterontheweb.org/>) are noteworthy because they allow students to interact with primary data in understandable and engaging ways. For example, the Data Visualization Tool in River Run allows students to explore major ecological events such as hurricanes, agricultural waste spills and a 500 year flood. Using the Data Visualization Tool, students can easily generate interactive animated graphic displays, which reveal details of important ecological events in ways that demand notice and invite further inquiry using the supplied Internet tools. Water on the Web allows for similar inquiry of lake data. For more information on both of these resources see Internet tools for facilitating inquiry (Moore and Huber, 2001) <http://www.citejournal.org/vol1/iss4/currentissues/science/article1.htm>.

**Table 3**

2000 NCSCOS	NSES- 6-8 Categories of Content Standards	Web site(s)	Contents
Population Dynamics	Unifying concepts and processes in science	<a href="http://www.worldbank.org/depweb/">http://www.worldbank.org/depweb/</a>	Activities and fact about population growth-world data

	Science as inquiry Physical science Life science Science and technology		
Evolution		<a href="http://www.jpoinstitute.com/index.jsp">http://www.jpoinstitute.com/index.jsp</a>	Dinosaurs
Hydrosphere Motion & Forces	Earth and space science Science and technology Science in personal and social perspectives History and nature of science Physical science Unifying concepts and processes in science Science as inquiry	<a href="http://www.bbc.co.uk/nature/blueplanet/games.shtml">http://www.bbc.co.uk/nature/blueplanet/games.shtml</a> <a href="http://www.waterontheweb.org/">http://www.waterontheweb.org/</a> <a href="http://www.uncw.edu/riverrun/idd.html">http://www.uncw.edu/riverrun/idd.html</a>	Games-interactive/ Dive to the Abyss; Open ocean-trivial game - answer questions to win game;

### Science Strands

The “strands” portion of the North Carolina Standard Course of Study (2001), state that all middle school students should learn about the following:

1. The Nature of Science, including developing understandings of science as a human endeavor and views of science sharpened by historical perspectives.
2. Science as inquiry, including the ability to effectively and safely use science process skills along with appropriate materials, scientific equipment, and technology in order to conduct scientific inquiries.
3. Competencies with respect to technologies relevant to science including competencies in performing technological design and knowledge and understanding of relationships between science and technology.
4. Understandings of science in personal and social perspectives including understandings of personal and community health, population growth, environmental quality, natural and human-induced hazards, current events/challenges and careers in science and technology.

In general, most of these strands can be strongly supported through many of the interactive Internet sites discussed above that are designed to give students access to virtual laboratory or other research equipment and settings. In fact, the only significant gap in the use of such sites for promoting learning within these strands is the goal of helping students to develop understandings of science from a historical perspective. Teachers might benefit from having students work with sites such as those listed in Table 4, which have marked strengths in facilitating the relevance of historical perspectives in science learning. Also included in Table 4 are the categories of content standards for Grades 6-8 from the National Science Education Standards. Incorporating these standards in the table provide clear evidence of how selected interactive web sites align with both state and national content standards.

Clearly the wealth of useful Internet resources designed to support science learning includes many interactive web sites highly congruent with and supportive of the North Carolina Standard Course of Study (2001). Highly interactive Internet sites, such as those referenced here, hold tremendous promise for facilitating relevant student learning.

**Table 4: Science Strands (6-8)**

<i>2000 NCSCOS  Science Strands</i>	<i>NSES-6-8 Categories of Content Standards</i>	<i>Web site(s)</i>	<i>Contents</i>
Science & Technology: What tech. are  (Cells & cell theory)	Life science  Unifying concepts and processes in science  Science as inquiry  Science & technology	<a href="http://www.usda.gov/news/usdakids/">www.usda.gov/news/usdakids/</a>  <a href="http://www.kathimitchell.com/cells.html">www.kathimitchell.com/cells.html</a>	Cells and cell theory; General science-teacher resources nutrition facts;  Various links for kids-safety & basic science concepts; English & Spanish versions
Science in Personal & Social Perspectives: Environmental quality	Science in personal & social perspective Earth and space science	<a href="http://facstaff.bloomu.edu/dwetzzel/scienceedresources.htm">http://facstaff.bloomu.edu/dwetzzel/scienceedresources.htm</a>	Link to various environmental/ecology clubs and organizations. Teacher and student resources
Science in Personal & Social Perspectives: Population growth	Science in personal & social perspective Life science History & nature of science	<a href="http://k12science.ati.stevens-tech.edu/curriculum/popgrowthproj/explorations.html">http://k12science.ati.stevens-tech.edu/curriculum/popgrowthproj/explorations.html</a>	Calculates world population /USA population
Science in Personal & Social Perspectives:	Science in personal & social perspective	<a href="http://www.brainpop.com/">http://www.brainpop.com/</a>	Contains creative movies that describes aspects of science and technology; trivial

Science & Tech.	Science & technology		facts; fun facts & activities
Science in Personal & Social Perspectives: Careers	Science in personal & social perspective	<a href="http://scilib.ucsd.edu/sio/guide/career.html">http://scilib.ucsd.edu/sio/guide/career.html</a> <a href="http://www.fl-ag.com/planetAg/careers.htm">http://www.fl-ag.com/planetAg/careers.htm</a>	General website about careers and teaching science
Science & Tech.: Understanding science & tech.	Science & technology History & nature of science	<a href="http://www.pbs.org">http://www.pbs.org</a>	Nova website-String Theory, science activities

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