

21st Century Skills Using Biology: Exploring Life

EL Chapter	Skill	Featured/Related EL Activity	Web 2.0 extension
overall	Media Literacy	Create a personalized start page for the class, using Netvibes or some other free service. Add a calendar, picture of the day, RSS feeds, weather, twitter feed - whatever. Students can use this as a starter spot for getting class information or posting their work.	
overall	Media Literacy	Create a class blog. Sign up for a free blogging service and start a blog. Choose one student to be note taker for the day, they post their notes. That student passes the assignment to the next student, and so on. Over time, the students will make the blog their own and dress it up, add to and enhance it. Encourage them to comment on each other's posts, consider awarding points for the quality of their entries.	
overall	Media Literacy	Hold electronic office hours. Using instant messaging, web ex, or just email set up a regular hour where you will be available online to answer student questions. Store your typed answers to typical questions for re-use in another session. Consider using an online interactive white board with students while you are working. You could also set this up as group session, where students try to answer each other's questions.	
overall	Media Literacy	Use VoiceThread to review an exam. Either you or your students can create a VoiceThread, narrating a discussion of results on a recent exam. Review correct answers, why incorrect answers were wrong, and insights gained from the assessment. The VoiceThread can be shared and archived for next year's students.	
1	Media Literacy	Reading a scientific article or web site (Skill Activity)	Go to a "spoof" web site and ask the students to determine if it is real or not. Show them how to discover the owner of a web site's content using easywhois.net
2	Interpersonal and Collaborative Skills	In activity 2.3, students learn how Northern Right Whales are tracked.	Participate in a citizen-science web site where migratory or observational data is shared. Many local zoos have "animal cams" where students can observe animal behavior online. This experience can be augmented by a visit to the zoo or a conversation with the zookeeper.

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3	Critical Thinking & Investigative Experience	Conduct a virtual experiment with zebra spiders and snowberry flies in the Skills section.	Assign the published article (available online), on which the activity is based. Students could contact the researchers to ask questions. Conduct an interview and record it for later broadcast or podcast. Copy and paste the text of the article into Word and see what a "word cloud" of the article looks like (key points, repeated terms will leap out).
4	Creativity	AcidRainQuest sends students out to look at maps and analyze pH and rainfall data.	Consider asking the students to construct a 5-Photo story about an environmental issue, like acid rain. Or use an online interactive periodic table to tell a five-photo story about a key element. Students put together their five-photo story and post it to Flickr. Tag their photos with an agreed-upon class tag and have everyone comment on each other's stories.
5	Interpersonal and Communication Skills	In the Ch 5 Careers feature, students meet two biochemists and learn about their work.	Ask students to find a scientist currently working in an area of interest to them (could be a doctor, dentist, technician, vet) and contact them via email to set up an interview. The interview could be recorded as a podcast, broadcast live to the rest of the class (or school), or written up as a blog post.
6	Critical Thinking	In the Ch 6 history feature, students learn about early microscopes and how they impacted scientists understanding of the natural world.	Send students to the virtual microscope site where they can view samples through a variety of virtual microscopes (SEM, TM, phase contrast, etc) in order to compare results, magnification, illumination, contrast, and intensity.
7	Information and Media Literacy	Activity 7.5 takes students through a pinball machine analogy to explain cell respiration.	Ask students to take screen shots of each stage (glycolysis, krebs, and ETC) of activity 7.5 and put together a narrated slideshow, explaining what they learned in their own words. The slideshow could be posted to slideshare or converted into an enhanced podcast for studying.
8	Creativity and Critical Thinking	Activity 8.2 leads students through activities to investigate the nature of light as related to photosynthesizing plants.	Students put together an Animoto (short music video made of still photos), explaining photosynthesis as a summarizing device. These animotos can be great "bell-ringers" to wrap up a unit or introduce one.

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9	Self-Direction and Accountability	Activity 9.4 leads students through the cell cycle mechanisms behind cancer.	Students can create a VoiceThread on cancer, explaining how its origin is related to the process of cell division.
10	Problem identification, Formulation, and Solution	Activity 10.2 explains Mendel's work and Activity 10.5 walks students through Morgan's fruit fly experiments.	Send students to the eyejot web site to create a video of themselves, explaining some aspect of Mendel's or Morgan's work, zeroing in on the problems they were trying to solve. The videos can be posted on a class web site, emailed to their parents, or to the instructor.
11	Critical Thinking and Systems Thinking	In activity 11.5 students build their own protein from a given strand of mRNA	Send students to view the famous, 1971 protein synthesis dance "happening". It's a movie filmed from an aerial perspective with Stanford students as the "molecular players". Ask them to blog about their favorite parts or the most confusing element. Consider making a video of a similar "happening" with your students (the mitosis square-dance?).
12	Problem identification, Formulation, and Solution	In activity 12.3 students learn how to interpret a pedigree	Teachers can set up fictional "families" with students in the class and then challenge students to create pedigrees that map the relationships. Pedigrees can be created online using flowcharting software so free applications, Lovely Charts, so that the pedigree can be posted and easily shared.
13	Critical Thinking and Systems Thinking	Students learn about DNA technologies in Concept 13.4 and stem cells in Concept 13.5	Send students to the University of Utah's activity on stem cells and to the New York Times site to research DNA technology articles in the news. Ask them to create a blog entry about what they learned and what questions they have. Students are given credit for commenting on each other's blog entries.
14	Information and Media Literacy	In activity 14.1, students learn about Darwin voyage.	Use a KMZ file to trace Charles Darwin's voyage on HMS Beagle on Google Earth.

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15	Critical Thinking and Systems Thinking	Students build a cladogram in Activity 15.4	Challenge students to create their own cladogram of an organismal group. They can render it on paper and scan it for posting or create it using a flowcharting program like Flowchart.com or Excel.
16	Problem identification, Formulation, and Solution	In Activity 16.5 students learn how viruses infect cells.	Send students to appropriate science journal articles on viruses in the news (H1N1, HIV). Using Diigo's highlighting and post-it notes features, have each student annotate their article with questions and connections to what they learned in the chapter. After you highlight an article within your Diigo account, you can generate a link to YOUR highlighted article so that anyone coming to the article via that link will see your highlights and notes. Once everyone's annotations are included, go over the article and what they
17	Creativity and Self-Direction	In activity 17.1, students will explore protist diversity.	Have students create an online comic strip about a protist. Use Pixton to create the comic strip and share with the class. Get them thinking about science as it appears in the comics with the Periodic table of comic books site. Consider collecting all the comics into a BioComic wiki.
18	Interpersonal and Collaborative Skills	In activity 18.2, students will explore the diverse forms of fungi.	Go to the PBS evolution site's "Mating Game" and encourage students, working in groups, to build a similar game for themselves, featuring fungi (or other organisms from the diversity unit). Each group could be assigned a different taxon.
19	Critical Thinking and Systems Thinking	Students will explore plant diversity in activities 19.1 - 19.5	Have students create an online concept map showing the characteristics and relationships between the major plant groups. You can easily create a free account on the MSU concept mapping site called ctools. Students should exchange maps and make comments.

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20	Creativity and Intellectual Curiosity	In this chapter's STS feature, students learn about the tiny wild mustard plant and its unusual characteristic.	Challenge students to write a digital story on the life of a favorite or important plant. Show them examples of other digital stories, so they can get a feel for the medium. Consider having them publish their stories in print form as well with any of the self-publishing websites like Lulu or Myebook. Uploading and designing your book online is free, but there is a modest fee to purchase the final, printed book.
21	Creativity and Problem Identification, Formulation and Solution	The investigative lab for this chapter, called "Zip Up the Xylem", has students making potometers.	Have the students videotape each other to document the procedure for this lab. Students in future classes can use the posted videos to prepare for the lab. You can use Bubbleply to annotate your video.
22	Creativity and Intellectual Curiosity	Students will learn about the way plants respond to their environment in activity 22.2	Using a digital camera, have students create a time lapse video of a plant response (flowering, wilting, leaf movements). They can take a series of stills and stitch them together, if you provide them with access to QuickTime Pro.
23	Self-Direction	Students explore invertebrate diversity in this chapter.	Consider sending students to a live web cam to observe invertebrates in zoos, aquariums, or in situ. You can also sometimes catch live web casts of symposium or relevant conferences.
24	Creativity	Students explore the arthropod phylum in activities 24.1 - 24.4	Check out this list of biology-related songs. Have students pick a favorite and then find one (on iTunes) that is appropriate for the Arthropods.
25	Information and Media Literacy	Students explore fishes and amphibians in activities 25.1 - 25.4	Send students to the Creative Commons site to research photos of coelacanths, sharks, and fishes. Working in teams, students can create slideshows for the various groups and annotate them with their names, habitat, and typical feeding patterns. In the process they can learn about intellectual property rights and the notion behind the creative commons.

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26	Problem identification, Formulation, and Solution	Students will explore the tremendous range of vertebrate diversity in Concepts 26.1 - 26.4.	To encourage students to think about animal size, have them watch a clip of the movie King Kong (available on YouTube) and then read Michael LaBarbera's essay "The Bigger They Are, The Harder They Fall" which is on the site on The Biology of B-Movie Monsters. Ask students to post a blog entry about the importance and evolutionary impact of size.
27	Critical Thinking and Systems Thinking	In this chapter, students will get an overview of the human body.	Set up a class wiki, devoted to human body systems. Create one wiki page for each system and assign student groups to fill the pages with relevant content (descriptions, images, links, drawings, disease information, etc).
28	Critical Thinking and Systems Thinking	In activity 28.2 students learn how a neuron conducts an impulse.	Students can put together a prez presentation, narrating the viewer through the events in nerve impulse conduction. Students could also try their hand at creating an animation of the impulse conduction events using the free animation creation site, GoAnimate.
29	Critical Thinking & Investigative Experience	In activity 29.3, students learn how to interpret a food label and nutritional information.	Assign students to collect nutrition labels from various food items they regularly eat at home. Scan them or photograph them and then gather the digital images in a wiki, organized by categories of the students' choosing (e.g. most nutritious, most confusing, processed foods, most caloric). Ask students to post a blog entry about what they learned and what surprised them.
30	Social Responsibility	In activity 30.4, students learn about cardiovascular disease.	If the chapter-opening 21st century activity is too time intensive for your class, try sending your students online to research cardiovascular disease (demographics, incidence, causes, treatments). Students can work in groups to create a presentation using PowerPoint, Prezi, or Voicethread.

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31	Creativity and Critical Thinking and Communication Skills	Students learn about the body's defense system in activities 31.2 - 31.4.	Students work in teams to write one-act plays depicting various immune responses. One team could act out the way cell-mediated immunity works, another the way vaccines work etc. Using the video setting on your digital still camera or borrowing a digital video camera, film the student productions and post them for others to see and critique.
32	Communication Skills	The lab for CH32 puts you in the role of a medical technologist.	Have students locate a willing physician or expert on an endocrine topic and then interview them (recording it with a digital recorder) and create a podcast of the interview. Podcasts can be shared through iTunes or uploaded to a web site. Since this is the endocrine system, you might want to set this up so that students must get the teacher's approval on their selection before proceeding with the assignment.
33	Information and Media Literacy and Creativity and Critical Thinking	Students learn about embryonic and fetal development in activity 33.4.	Using the information in their book and on helpful external sites like the multi-dimensional human embryo, have students construct their own online timeline of either the menstrual cycle or of gestation. Xtimeline and Timetoast are free online timeline creation sites. Students can embed images or video.
34	Creativity and Intellectual Curiosity	In activity 34.2, students examine factors that affect local climates.	Create an activity by using a KMZ file with Google Earth to send students to pre-determined locations on the globe and note the abiotic factors in each location. Ask them to connect what they learn from looking at the global locations to what they learned in activity 34.2 in a blog post or a short essay.
35	Self-Direction	Pre Lab activity, Dynamic Populations (trout tagging)	Have students Research the Shenandoah National Park watershed, where this activity takes place. Put together a multimedia presentation on this Park or another national park near you.

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36	Accountability and Social Responsibility	FloridaLakeQuest	Use the US EPA site's My Environment to bring up the environmental data in your zip code. Take screen shots and put them into a PPT deck, post on SlideShare. Or use Mapme to create a map of natural areas or hiking trails in your area.
36	Accountability and Social Responsibility	36.4 Human activities can alter ecosystems	Send students to this video (on YouTube) revealing green house gas sources. Encourage students to research other videos on environmental issues and share with the class. Candidate videos can be bookmarked or put in a YouTube favorites file.

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Links	Example
www.netvibes.com	
www.blogspot.com , www.wordpress.com	
http://www.google.com/talk; www.aim.com; www.dimdim.com; http://www.skrbl.com/	
www.voicethread.com	http://voicethread.com/?#q.b601172.i0.k0
http://easywhois.net/	Spoof chemistry site: http://www.dhmo.org/
www.monarchwatch.org/ http://whale.wheelock.edu/whalenet-stuff/Rat_unit.html, http://www.windows.ucar.edu/citizen_science/budburst/	

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<p>www.sciencemag.org/cgi/content/abstract/236/4799/308; For live broadcasting try www.livestream.com; To generate word clouds go to: www.worldle.net</p>	
<p>www.flickr.com, http://www.flickr.com/groups/visualstory/;</p>	<p>http://www.flickr.com/groups/visualstory/discuss/</p>
<p>For live broadcasting, try www.livestream.com; Tips about podcasting http://www.how-to-podcast-tutorial.com/index.htm</p>	
<p>http://micro.magnet.fsu.edu/primer/virtual/virtual.html</p>	
<p>Camtasia for podcasting and</p>	<p>An enhanced podcast on Charles Da</p>
<p>www.animoto.com</p>	<p>http://animoto.com/play/xNC1g0uWLDkzNk4k3EYQ?autostart=true</p>

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www.voicethread.com	http://voicethread.com/?#u68532; http://voicethread.com/?#q.b45226.i236813
http://www.eyejot.com	
http://www.scivee.tv/node/2571	
<p>pdf of a pedigree chart: http://www.byub.org/ancestors/charts/pdf/pedigree.pdf; free software to create a pedigree: http://www.smartdraw.com/specials/pedigree-charts.htm; http://www.lovelycharts.com/</p>	
http://learn.genetics.utah.edu/content/tech/stemcells/ ; http://nytimes.com/	
http://earth.google.com/ ; for more on KMZ files: http://en.wikipedia.org/wiki/Keyhole_Markup_Language	http://darwinsafari.blogspot.com/2008/04/darwins-voyage-of-beagle.html

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<p>http://www.flowchart.com/ ; How to make a cladogram worksheet: http://www.bu.edu/gk12/eric/cladogram.pdf; how to make a flowchart in Excel: http://www.breezetreecom/articles/how-to-flowchart-in-excel.htm</p>	
<p>www.diigo.com</p>	<p>Here's an example of an article annotated in Diigo: http://www.diigo.com/annotated/7816276334d0c4fe187636b0ffa3a09c</p>
<p>www.pixton.com and here</p>	<p>http://www.toondoo.com/ViewBook.toon?bookid=103592</p>
<p>http://www.pbs.org/wgbh/evolution/sex/mating/index.html</p>	
<p>https://ctools.umich.edu/portal/site/gateway/page/1091327577219-1420518</p>	

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<p>Check out the Center for Digital Story Telling for advice and suggestions: http://www.storycenter.org/index1.html; Self-publishing site: www.lulu.com; www.myebook.com</p>	<p>Great digital story telling: http://www.bbc.co.uk/wales/audiovideo/sites/galleries/pages/capturewales.shtml</p>
<p>http://www.bubbleply.com</p>	
<p>QuickTime pro is available online for \$30: http://www.apple.com/quicktime/download/</p>	<p>http://teachtools.pbworks.com/Video+and+Video+Capture</p>
<p>http://www.nescent.org/NABT09Webcast.php</p>	<p>http://nationalzoo.si.edu/Animals/WebCams/default.cfm; http://www.montereybayaquarium.org/efc/cam_menu.aspx; http://www.africam.com/wildlife/index.php; http://www.webcamlocator.com/animals/animals_index.html</p>
<p>http://www.ericjsimon.com/biologysongs/</p>	
<p>http://www.flickr.com/creativecommons/; Use an application like pictobrowser to display Flickr images on websites and blogs. http://pictobrowser.com/</p>	

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<p>http://fathom.lib.uchicago.edu/2/21701757/; http://www.youtube.com/watch?v=_JcKdgAQ8s0</p>	
<p>www.wetpaint.com</p>	<p>http://cyhsanatomy2.wikispaces.com/</p>
<p>www.prezi.com; http://goan</p>	<p>http://prezi.com/54wzblr56zyf/view/</p>
<p>www.wetpaint.com is a free wiki creation site.</p>	
<p>www.prezi.com; www.voicethread.com</p>	

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<p>www.itunes.com; here is a podcasting tutorial: http://www.how-to-podcast-tutorial.com/index.htm</p>	<p>http://faithapbiology.podcastpeople.com/posts/8534</p>
<p>http://embryo.soad.umich.edu/index.html; http://www.xtimeline.com/; http://www.timetoast.com/</p>	
<p>http://earth.google.com/</p>	<p>http://robinheyden.wordpress.com/2009/07/15/jaguar-conservation-and-google-earth/</p>
<p>www.prezi.com</p>	<p>Here's a prezi that a bio student created on the Redwood National Park:http://prezi.com/31052/</p>

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www.epa.gov www.slideshare.net	www.slideshare.net/rheyden/epawelleley-1731299
http://www.youtube.com/watch?v=eJpj8UUMTaI	