What Do Students Have to Say About Ecology and Evolution? Using Podcasting to Apply Integrative Biology Themes Across the Tree of Life

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Abstract

We describe a versatile podcasting assignment that requires students to (i) review primary and secondary literature relating to an assigned organism with the goal of identifying the main features of its ecology and evolution, (ii) prepare an enhanced podcast about their organism, and (iii) critique peer podcasts. The goal of this assignment is for each student to gain a fuller appreciation for and understanding of biological diversity. This assignment will enhance students' research, technology, and communication skills while reinforcing the main themes of integrative biology.

Activity

Invitation for User Feedback. If you have used the activity and would like to provide feedback, please send an e-mail to MicrobeLibrary@asmusa.org. Feedback can include ideas which complement the activity and new approaches for implementing the activity. Your comments will be added to the activity under a separate section labeled "Feedback." Comments may be edited.

Learning Objectives.

By completing this assignment, students will:

1) Enhance their knowledge of the ecology and evolution of various forms of life.

2) Improve their research skills by searching for accurate information about the organism they are assigned.

3) Acquire the technical ability to produce a podcast.

4) Improve their ability to communicate biological information clearly and concisely to peers.

5) Construct a broader and deeper understanding of the diversity of life through peer review of podcasts.

Background.

Podcasting has been rapidly expanding since its debut in 2004, and this medium is not a novelty to today's generation of tech savvy college students. Podcasting may, in fact, represent a more approachable and enjoyable medium for communication than traditional written assignments. Our goal was to develop and implement a podcasting assignment that would enhance student technology skills and improve student learning in an introductory biology course.

Integrative Biology is a required course for Biology majors at the University of Richmond. The themes explored include evolutionary mechanisms, speciation, diversity, and ecology. One important course goal is to challenge students to think broadly about biological information and to construct an understanding of, and appreciation for, the biological mechanisms by which the diversity of life on the planet came to be. One third of the course is devoted to description of various forms of life (Bacteria, Archaea, Protists, Animals, etc.). We have struggled with engaging students in this section because they can become overwhelmed by detail and the complex life histories of the various types of organisms. Therefore, we developed a podcasting assignment to improve student engagement in this section of the course and create enthusiasm for all branches of the Tree of Life. Each student was assigned a species from a comprehensive list and asked to prepare an enhanced podcast on that organism's ecology and evolution. "Enhanced" podcasts consist of an audio track accompanied by a slide show. Enhanced podcasts can be viewed on any computer with a media player or a video mp3 player (e.g., a video iPod).

This podcasting assignment requires students to (i) consult primary and secondary literature sources, (ii) learn how to use podcasting hardware and software, (iii) record and launch their own enhanced podcast, and (iv) listen to and review peer podcasts. Students provided feedback on the assignment in the form of an audio recording for extra credit. To complete this assignment, students need good basic computing and library research skills. Students should also understand basic concepts in ecology and evolution, such as phylogeny, systematics, and niche. We presented this material in our lecture and laboratory sessions. Effective implementation of this assignment relies on students' natural curiosity regarding technology, enthusiasm with respect to their assigned organism, and willingness to listen to and critique their peers.

PROCEDURE

Materials.

1) Computers

We used Apple Macintosh computers, but options are presented below for completing the assignment using PC computers. An mp3 player, such as an iPod, offers students a portable option for listening to podcasts but is not necessary to complete this assignment.

2) Podcatching software (for downloading podcasts from the Internet and facilitating their transfer to mp3 players or iPods)

We used Apple's iTunes. This popular and free software is available for both PC and Mac platforms and provides an easy way to organize an audiovisual library and search for additional podcasts of interest.

3) Podcasting software (for making original, enhanced podcasts)

We used Apple's GarageBand 3, part of the iLife '06 software package (not available for PC's). At the time of the assignment, Apple's GarageBand enabled the easiest creation of an enhanced podcast in a format accessible by a wide variety of media players. Students were able to drag and drop images into the file, create their own musical "intros" and "outros," and add links to Internet sites and additional metadata. The intuitive interface of GarageBand enabled students to dive right into making their podcasts. Using Apple's GarageBand also meant that students had to come to the University's Technology Learning Center to complete their podcasts (as relatively few students had their own Apple computers). This provided an atmosphere where they were able to receive support and encouragement from technology staff.

Students wishing to go beyond the scope of an enhanced podcast created "vodcasts" (video podcasts) using Apple's iMovie. There was no additional training provided to students in this software. The vodcasts showed a more advanced technological detail, e.g., with subtle transitions between images and audio, that added to the overall effect of the piece.

It is possible to carry out this assignment on PC computers using software for the Windows operating system. Photo Story 3 is a free download from the Microsoft website that can be used to create enhanced podcasts. Using this software, students can drag and drop photos, record their narrative tracks, add background music, add transitions between photos, and complete small photo editing changes using special filters already installed. Photo Story creates a file in .wmv format, which is viewable using Windows Media Player 11. (Photo Story is not currently available for the Macintosh platform.) Free software is available that converts podcast files generated using Photo Story from .wmv format to .m4a format so that they can be played on multiple operating systems (http://www.ipod-video-converter.org/).

Other available software: Audacity is Mac and Windows friendly software available for free from the SourceForge website (http://audacity.sourceforge.net/) that allows for the editing of audio files. Editing audio files can take a large amount of time and is not recommended for most students. This application does not support the production of enhanced podcasts.

4) Recording equipment

Students used Plantronics 400 headsets with microphones to record the narrations for their podcasts. Originally, we envisioned students recording their narrations using a microphone attached to their iPods (MicroMemo iPod microphone), but the Plantronics microphones provided a better quality sound.

5) Website to host podcasts

A significant challenge to this project was defining our approach to the copyright limitations imposed by the students' use of Internet downloaded images for their enhanced podcasts. We used iWeb to create a website that hosted student podcasts and generated an RSS feed automatically which made it easy for students to download each other's podcasts. We opted to password protect the website. A password-protected site also could easily be set up with the latest version of Blackboard (version 7). The Discussion Board feature in this release allows for a ratings feedback system that could be used for peer critiques.

List of Organisms.

Species List

Procedure—Student Version.

Assignment Description

StoryBoard Example

GarageBand Instructions

PhotoStory Instructions

Peer Critique

SamplePodcast1 (podcast audio track only)

SamplePodcast2 (excerpt of a podcast prepared with iMovie)

Copyright permissions have been sought and obtained for the music and images in this excerpt. Images were provided by Steve Neeley from his website, the Joseph Leidy Microscopy Portal (http://www.xmission.com/~psneeley/Personal /Leidy.htm); music was provided by the DJ Williams Projekt.

Suggested Timeline.

We implemented this as a semester-long project:

Week 1. Organisms are assigned; students start research

Week 4. Storyboard outline due

Week 5. Podcast workshops

Week 8. Completed podcasts due and launched

Weeks 8–10. Peer critique of assigned podcasts

Procedure—Faculty Version.

The assignment:

To build on student interest and enthusiasm about podcasting, we hosted a short evening session during the first week of classes. Each student drew the name of their assigned organism randomly from a beaker. A handout was distributed containing the assignment details, which were also posted on Blackboard. Students viewed clips of instructor-prepared enhanced podcasts. This session helped us create a community of students all working towards a better understanding of life's diversity via podcasting.

Research and storyboard preparation:

Students were provided with several resources to assist them with this step of the assignment. Two instructor-prepared enhanced podcasts were available to serve as models for the students' own work. A model "storyboard" was distributed as well (via Blackboard) to give students ideas for how to script their podcasts. Students were encouraged to use the reference librarians on campus for assistance, and many students also consulted biology faculty. We required students to complete their storyboards before actually learning how to make a podcast so that they would have a script to work with and all their visual resources in one place.

Instruction for how to make a podcast:

Students signed up to attend their choice of sessions during which they worked with staff from the University of Richmond Center for Teaching, Learning, and Technology to learn the basic steps for making a podcast using GarageBand. Students also were given a step-by-step instruction sheet so that they could work through the process independently. Students were encouraged to break their podcast up into short sections for recording their narratives, so that they could re-record segments as needed without starting from the beginning.

Launching the podcasts:

To "turn-in" a completed podcast, students simply transferred the .m4a file associated with their podcast to a designated

intranet folder. From there, all podcasts were posted to the website by Center for Teaching, Learning, and Technology staff. We used iWeb to create a password-protected website that hosted student podcasts. A password-protected site also could easily be set up with Blackboard 7, the latest version. From the website, students could subscribe to the course podcasts via an RSS feed and download them to iTunes for viewing on their personal computers or iPods.

Peer review:

Students were required to listen to a minimum of five randomly-assigned peer podcasts and rate each using a five-star system. A critique rubric was provided to assist with this. The Blackboard 7 Discussion Board feature allows for a ratings feedback system that could be used for peer critiques.

Feedback:

At the end of the semester, students were asked to complete an optional feedback in the form of an audio recording that answered several specific questions about the podcasting assignment. We offered a small amount of extra credit for this feedback.

Suggestions for Assessment.

This assignment represented 7.5% of the total grade in our course (a four-credit lecture and lab course).

Grading:

Storyboard: 15 points

Podcast: 50 points

- 25 points for content (accurate, informative, interesting, good quality sources)
- 25 points for presentation quality (clear, entertaining, put together well)

Critiques: 10 points

Total: 75 points (out of a course total of 1,000 points)

Grading Rubric

Field Testing.

We have used this assignment for two sections (63 students total) of a sophomore-level introductory biology course (Integrative Biology I, Fall 2006).

Student Data.

Research on learning has demonstrated that students construct knowledge by talking to each other about the subject matter, such as was accomplished through this podcasting assignment. This was clearly demonstrated through the audio feedback we gathered regarding the assignment. Students were asked to comment specifically on the following:

- How did creating a podcast and listening to other students' podcasts enhance your knowledge of the ecology and evolution of various forms of life?
- What new skills did you acquire with this project—consider technical skills, research skills, and others?
- What were the positives and negatives associated with this novel presentation tool (i.e., podcasting)? Did the storyboards help you organize the material so that you understood issues more completely?
- How do you feel about the organism that was the centerpiece of your podcast? What were your initial thoughts about your organism and did they change during the course of the project?

Eighty-one percent of the students in the course submitted feedback, and several important themes emerged in their responses. First, students seem to have been thoroughly engaged by the project. The majority of the assigned organisms were obscure (generally not charismatic megafauna) and perhaps initially unappealing to the students. By choosing rare and strange species and using the podcast mode of communication, we found students got really excited about their organism and the place that the species fell within the tree of life. By the end of the assignment, the majority of students had grown attached to their assigned organisms, as evidenced by the enthusiasm and effort they put into their podcasts. Thirty-three percent noted in their responses that they had started with a neutral to negative opinion of the project and their assigned organism but found that the more they worked on the project, the more they liked the organism and enjoyed the work.

Second, another piece of evidence in the audio feedback for the degree of student engagement and learning was that 41% of students used the scientific (Latin) name of their organism at some time during their response, even though this information was not requested! In several instances, a student would simultaneously be saying that they weren't sure how much they had learned, and then go on to relate lots of good information that they remembered, including scientific terms. We felt that the podcasts the students produced showed a high degree of literacy with respect to the course material. They used the terms and concepts that were presented in class accurately and in the appropriate context. They were able to describe the evolutionary history of their organisms by presenting phylogenetic information. They introduced aspects of the organism's ecology, and many students included relevant conservation information.

Third, students reported that learning the skills necessary for the podcast was time consuming, but most of them seemed to feel it was a valuable skill to learn. Forty-nine percent named the technology skills as something new they learned from

doing this project. The overall feeling about learning technical skills was positive. They also felt that the structure of the assignment, including the storyboard, was helpful. One of the drawbacks that students reported was related to convenience. They did not like having to go to the computer lab to work on their projects. The majority of the students had PCs (only eight of the respondents had Macs).

Finally, one of the goals of the course (Integrative Biology I) is for students to gain an appreciation for the diversity of life on the planet and the processes that have led to the evolution of this diversity. Many students accepted and enjoyed the new learning experience and understood its connection to the learning goals of the class. A good example of this is the following student comment: "I wasn't excited to start, but engaging in research…helped me to see all the trouble scientists have with this organism and that helped me understand more about what integrative biology is all about." We felt that the students became involved with the material focused on diversity of life in a manner that is rare using traditional presentation methods. Rather than seeing diversity as something to memorize, these students recognized that our understanding of species and their evolutionary and ecological relationships is an ongoing discussion. This was somewhat surprising given that their podcast focused on a single taxon. Nonetheless, the students seemed much more capable of seeing connections among the various organisms. Furthermore, students were able to share what they learned in class. For example, when microbial metabolism was a lecture topic, the student who prepared a podcast on *Rhodobacter rubrum* was able to contribute to the class by answering the question "Does one species of bacteria have a single type of metabolism or not?" This kind of peer exchange is a very effective form of learning.

SUPPLEMENTARY MATERIALS

Notes and Hints.

Collaboration with computing and technology support staff is important to implementing this assignment with ease. The relationships between faculty and staff that we established over the course of this project were not ephemeral, however, and we continue to explore new ways to incorporate technology into student learning.

Assigned organisms should be carefully selected in order to provide meaningful examples of course concepts. We also made a deliberate effort to incorporate many relatively rare and strange organisms into our list for which little information can be gleaned via Internet search engines and/or Wikipedia. Other lists could easily be generated to suit other types of courses (e.g., all microbes for Microbiology or all pathogens for Medical Microbiology).

The course instructors involved in this project (Treonis and Hill) enjoyed learning the technology and making their own podcasts. Overall, we learned that the best podcasts (like the best teaching in general) incorporate a bit of goofiness and humor throughout to keep students engaged. Students should be strongly encouraged to be creative and put their personality into their podcasts. In an attempt to "brand" all of the podcasts produced by our students, we prepared an optional intro/outro jingle tune and image, which many students chose to use.

By choosing Mac-based software, we essentially required all of our students to come to a computer lab to record their podcasts. The benefit was that students were doing their work where they could be supported by Center for Teaching, Learning, and Technology staff who provided advice and creative encouragement. On the other hand, a key insight from implementing this assignment was that our students prefer to be able to work on assignments like this on their own computers, at their own convenience. Alternatives to GarageBand that would allow students to work more independently are discussed above.

Possible Modifications.

The possibilities are endless for modification of this assignment to suit particular course objectives. This assignment can replace or augment an existing traditional, written research paper assignment. Furthermore, this can easily be implemented as either an individual or group assignment.

Organism List for Podcast Assignment: Example

ARCHAEA

Acidianus ambivalens (acidophilic, thermophilic)
Archaeoglobus fulgidus (sulfur reducers)
Geoglobus ahangari (hyperthermophile)
Halobacterium salinarum (halophile, bacteriorhodopsin)
Metallosphaera prunae (thermoacidophilic)
Methanobacterium thermoautotrophicum (methanogen)
Methanopyrus kandleri (methanogen)
Nanoarchaeum equitans (tiny symbiont)
Natronomonas pharaonis (haloalkaliphilic)
Pyrodictium abyssi (deep-sea thermophile)
Pyrolobus fumari (deep-sea hydrothermal vent)
Sulfophobococcus zilligii (alkaline hot springs)
Thermoplasma volcanium (solfatara fields)

BACTERIA

Acidobacterium capsulatum (soil bacteria, relatively new lineage)
Afipia felis (cat-scratch disease)
Amoebobacter pendens (purple sulfur bacterium)
Aquifex aeolicus (bacterium, basal position on eubacterial branch)
Bacillus marismortui (halophilic, salt crystals)
Centibacterium arsenoxidans (arsenate oxidizer)
Colwellia psychrerythraea (psychrophile)
Deinococcus radiodurans (UV-resistant bacterium)
Desulfococcus multivorans (sulfate reducing)
Flavobacterium psychrophilum (bacterial fish pathogen)
Gemella haemolysans (infections in humans)
Helicobacter canis (dog digestive system)
Hydrocarboniphaga effusa (hydrocarbon degrader)
Idiomarina abyssalis (deep-sea bacterium)
Leifsonia xyli (sugarcane pathogen)
Leptothrix discophora (sheathed bacteria)
Leuconostoc carnosum (meat spoilage)
Mesonia algae (associated with marine algae)
Rhodospirillum rubrum (metabolically diverse)
Samsonia erythrinae (tree pathogen)
Stella humosa (star-shaped bacterium)
Streptococcus ovis (sheep)
Streptomyces clavuligerus (soil, antibiotics)
Synechococcus elongatus (cyanobacterium, marine)
Thiomargarita namibiensis (huge bacterium)
Tsukamurella spumae (sewage sludge)
Verrucomicrobia spinosum (prosthecate bacterium)
Vibrio splendidus (marine pathogen)

Weeksella virosa (vaginal resident)
Wigglesworthia glossinidia brevipalpis (tsetse fly)
Xenorhabdus nematophila (entomopathogenic bacterium)
Yersinia pestis (black death, gamma proteobacteria)

PLANT
Amborella trichopoda (most primitive living angiosperm)
Amorphophallus titanum (corpse flowers)
Atropa belladonna (deadly nightshade)
Ceratozamia hildae (bamboo cycad)
Coleochaete orbicularis (basal plant lineage)
Ephedra gerardiana (gymnosperm, source of ephedra)
Impatiens capensis (spotted jewelweed)
Isoetes melanopoda (Blackfoot quillwort)
Isopogon ceratophyllus (horny conebush, *Proteaceae*, angiosperm)
Notothylas himalayensis (hornwort)
Platanthera peramoena (purple fringeless orchid, Virginia native, rare)
Pneumatopteris sandwicensis (fern)
Rafflesia arnoldi (world's largest flower)
Sphagnum squarrosum (peat moss)
Symplocarpus foetidus (skunk cabbage)
Thuja plicata (western red cedar, gymnosperm)
Welwitschia mirabilis (*Gnetophyta*, gymnosperm)
Wolffia microscopica (duckweed, world's smallest flowering plant)

ANIMAL
Aplysia dactylomela (spotted sea hare)
Ascaphus truei (tailed frogs)
Astrangia poculata (northern star coral)
Chaetognath (arrow worms)
Conus geographicus (cone snail)
Cotesia congregatus (parasitoid of hornworm)
Dermochelys coriacea (leatherback turtle)
Evalljapyx leechi (arthropod, *Diplura*)
Fujientomon dicestum (arthropod, *Protura*, primitive hexapod)
Gekko gecko (Tokay gecko)
Gulo gulo (wolverine)
Hapalochlaena lunulata (blue-ringed octopus)
Hirudo medicinalis (medicinal leach)
Sarcophilus harrisii (Tasmanian devil)
Kiwa hirsute (yeti crab)
Lama guanicoe (guanaco)
Macrobiotus hufelandi (tardigrade found in Antarctica)
Macrotis lagotis (bilby)
Manis gigantea (giant pangolin)
Mnemiopsis leidyi (comb jelly)

Mola mola (sunfish)
Neoglyphea neocaledonica (living fossil crustacean, shrimp/crab)
Pallene phantoma (sea spider)
Podura aquatica (springtail)
Portia labiata (white-moustached portia)
Priapulus caudatus (penis worm)
Procavia capensis (rock hyrax)
Pycnopodia helianthoides (sunflower star)
Pygopus nigriceps (western hooded scaly foot)
Riftia pachyptila (tubeworm)
Scutigera coleoptrata (house centipede)
Simnialena uniplicata (predator of *Leptogorgia*)
Stomolophus nomurai (giant jellyfish)
Strigops habroptilus (kakapo)

PROTIST
Amphisphaera sp. (radiolarians)
Chaos glabrum (lobose amoeba)
Chroomonas sp. (protist, cryptomonad flagellate)
Gromia terricola (protist, amoeboid)
Macrocystis pyrifera (giant bladder kelp)
Pyramimonas parkeae (micromonad, flagellate ancestor of green algae)
Reclinomonas americana (protozoa, primitive mitochondria)
Sticholonche zanclea (protist, heliozoa)
Vampyrella lateritia (protist, unusual feeding, filose amoeba)
Volvox globator (photosynthetic colonial protist)

FUNGI
Amanita muscaria (magic mushroom")
Amanita phalloides (death cap fungus)
Armillaria ostoyae (honey mushroom)
Cladina rangiferina (reindeer lichen)
Cladonia cristatella (British soldier)
Ophiostoma ulmi (Dutch elm disease fungus)
Rhizopus stolonifer (strawberry rot)
Websdanea lyginiae (smut fungi)

Podcasting Assignment Description: Example

For this project, you will learn about the evolution and ecology of a single organism that you probably don't already know much about. This process hopefully will bring to life several key concepts that are part of this course (e.g., phylogeny, taxonomy, tree of life, body plans, diversity, etc.). You will present what you learn to your classmates via an enhanced podcast that you will produce. You will also learn about other organisms by listening to and critiquing the podcasts of your peers.

Steps:

1) Obtain the name of your randomly assigned organism from your instructor.

2) Gather information about your organism, documenting your sources along the way. The Internet probably won't be a sufficient source for this assignment, and you will need to employ your library research skills and use databases (we love the Web of Science) to obtain scholarly articles about the ecology and evolution of your organism. The reference librarian can help you search for information, as can many of the professors in the Biology department.

3) Identify key pieces of information about your organism using the guidelines provided below as a starting point. Assess the quality of your sources critically.

4) Start to outline the storyboard for your podcast and gather up the visual and audio resources that you will need to produce it. Submit your storyboard, including a reference list, for evaluation.

5) Attend and participate in a "How to prepare a podcast" tutorial session where you will learn how to use the application GarageBand to prepare an enhanced podcast.

6) Produce your podcast and submit it for launching. Your podcast should be about 5 minutes long.

7) View and critique the podcasts of your peers during the allotted time period.

Note: instructor-prepared example podcasts are available for your viewing pleasure.

Suggested topics to research for inclusion in your podcast:

1) Correct pronunciation of your organism's name. What is the meaning behind the Latin name of your organism (e.g., *Homo sapiens* means "wise man" in Latin)?

2) What does the organism look like? Can you obtain any pictures or line drawings to include in your podcast? Does the organism look the same throughout its life cycle? How big is your organism? Does your organism make any sounds?

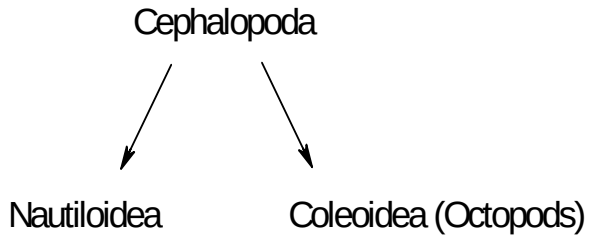
3) How would you describe the ecology of your organism? What is its habitat? What is its role in that ecosystem? What does it eat? What eats it? How does your organism get energy?

4) Why is this organism interesting biologically? Does it do something in its life cycle that is significant (e.g., lithotrophy, alternation of generations, viviparity, hermaphrodism, etc.)? Does it have unusual motility or body plan?

5) Where does your organism fit on the tree of life? What defines this particular branch of the tree of life? Is your organism a type of "living dinosaur"?

Storyboard Example

Podcast audio script	Images that will display when narrative is played
Intro jingle music	Tree of life image: http://www.tolweb.org/tree/
Hapalochlaena lunulata's common name is the greater blue-ringed octopus. *H. lunulata* is a very small organism that reaches only 200 mm (about 8 in.) in length when totally spread out. Its mantle size is 30 to 50 mm (1 to 2 in.) on average. It is covered with bright iridescent blue rings of approximately 8 mm (1/3 in.) in diameter.	Image of *H. lunulata* (used here with permission from Roy Caldwell, University of California, Berkeley) 
Hapalochlaena lunulata belongs to the phylum *Mollusca*, which means that it is related to other mollusks such as oysters, clams, and snails. This species belongs to the class *Cephalopoda*, which means "head foot."	Kingdom: *Animalia* Phylum: *Mollusca* Class: *Cephalopoda* Order: *Octopoda* Family: *Octopodidae* Genus: *Hapalochlaena* Species: *lunulata*

Scientists believe that the cephalopods first appeared some time in the Upper Cambrian period about 500 million years ago. The *Cephalopod* class split into two approximately 470 million years ago. Today about 700 cephalopod species exist, and *Hapalochlaena lunulata* is one of the deadliest of all cephalopods.	
H. lunulata is a very poisonous species, one of the deadliest in the ocean. Their bright blue spots are thought by some to be warning coloration. *H. lunulata* has a venomous bite that is often so small that it is unfelt by the victim. Within 5 to 10 minutes of receiving a bite, the victim can have difficulty breathing, muscular weakness, and nausea which can quickly be followed by respiratory failure and death. The venom is contained in the octopus' saliva and is called tetrodotoxin. The toxin in the venom blocks the propagation of nervous impulses in nerves which produces voluntary muscle paralysis.	Image of poison symbol: http://www.sa.wbu.edu/epp/chemical_files/image001.gif
H. lunulata is one of four blue-ringed octopus species and can be found in the Indo-Pacific ocean from northern Australia to the Philippines and Indonesia. This species lives in the sandy areas among small corals and feeds mostly on small crabs, hermit crabs, and shrimp.	Map of region *H. lunulata* is found in: http://www.sino.net/guide/images/indonesia/map.gif

Mating between male and female individuals can be initiated by either sex; however, most interactions are terminated by the female often with great struggles against the male. Copulation can last anywhere from 25 minutes to 4 hours. The males use their modified arm, known as the hectocotylus, to transfer sperm to the female. Females lay between 60 and 100 eggs ranging in size from 2.5 to 3.5 mm long. Females only reproduce once in their lives then die a few weeks after the eggs are hatched. Gestation time for the eggs is approximately one month.	Image of *H. lunulata* mating: http://www.thecephalopodpage.org/lunulata.php
Most cephalopod species, including *H. lunulata*, possess an ink sac; however, this particular species has a reduced ink sac. It is thought that instead of a defensive mechanism allowing *H. lunulata* to escape from predators such as *Odontodactylus scyllarus* (peacock mantis shrimp), its limited inking release is due to unusually strong contractions of the mantle.	Image of *Odontodactylus scyllarus:* http://www.ucmp.berkeley.edu/arthropoda/crustacea/malacostraca/eumalacostraca/royslist/species.php?name=o_scyllarus

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Podcasting Exercise

STEP 1. Open GarageBand and select **New Podcast Episode.**

You will be creating an enhanced podcast about your creature. Images of your creature, an audio intro, and an audio outro are in the **assets** folder on your desktop.

You should script your podcast before recording. Please refer to your instructors' podcasts for inspiration:

[Insert the URL for your instructor podcasts here]

STEP 2. Name your project and save it as Genus_species on your desktop.

Back this file up in two locations.

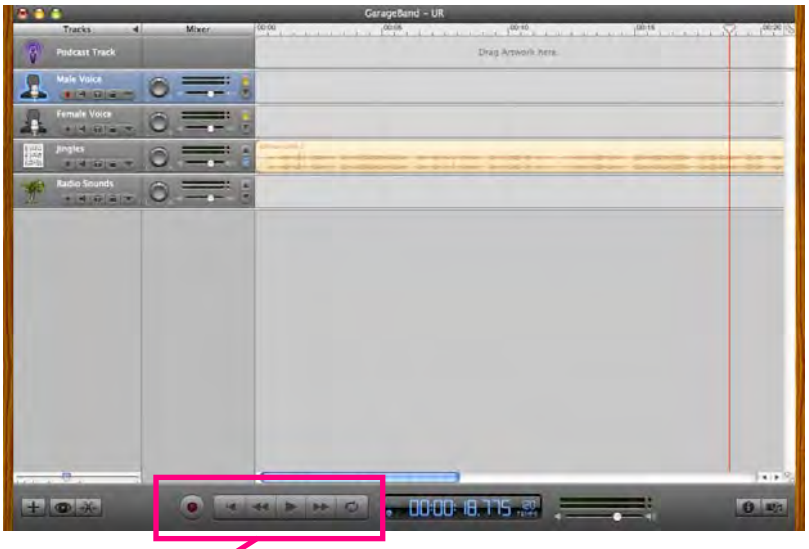
STEP 3. Add your Intro.

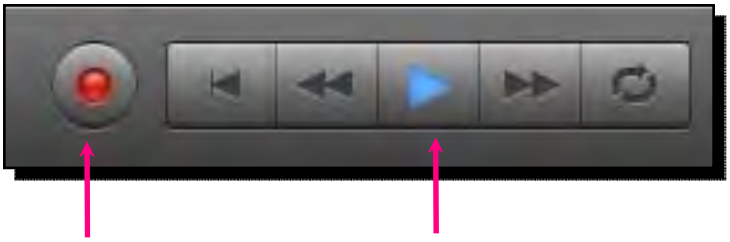
- Open the **assets** folder on your desktop.
- Locate the **beginning.aif** file and drag it to the **Jingles** track. This will be your Intro.

STEP 4. Record your podcast.

- Click the Male or Female voice track.

The track will change color when you select it.





Click these buttons to start and stop recording. You will use the other buttons to rewind and play your recorded audio.

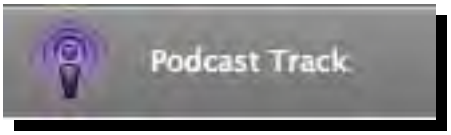
Record **Stop recording**

Your recorded audio

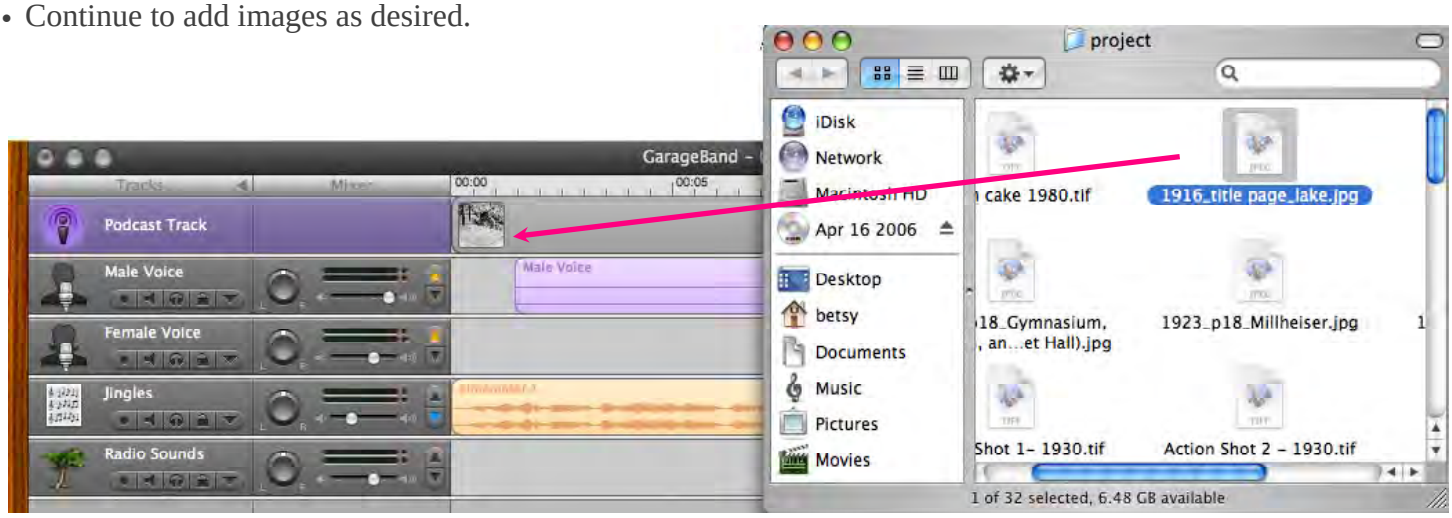
If you are unhappy with your audio click to select it, press the delete key, and record again.

Reposition your audio by clicking and dragging it to another location on the track.

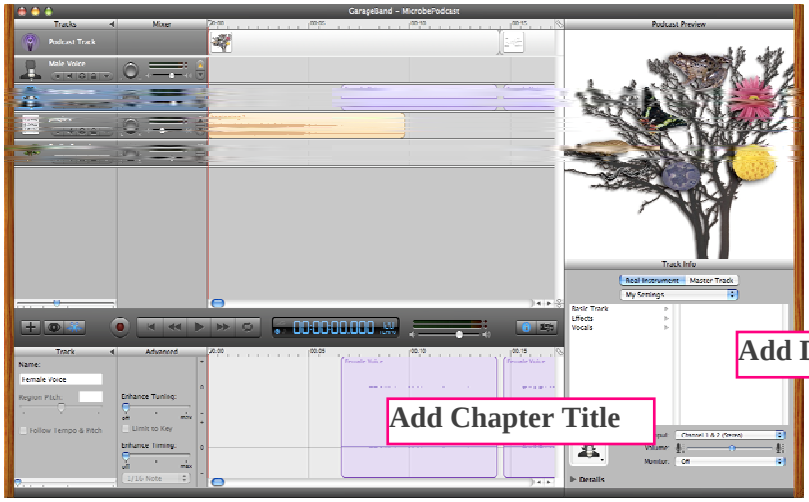
STEP 5. Add images to the PodcastTrack.



- Open the **assets** folder on your desktop.
- Select an image and drag it to the **Podcast Track**.
- Move the image along the track to match it to the corresponding audio.
- Continue to add images as desired.



STEP 6. Add episode artwork, chapter titles, and a description.



NOTE: If your screen doesn't look like the one above you may need to activate the **Track Editor** and **Track Info** options.

Track Editor **Track Info**

STEP 7. Create your Outro.

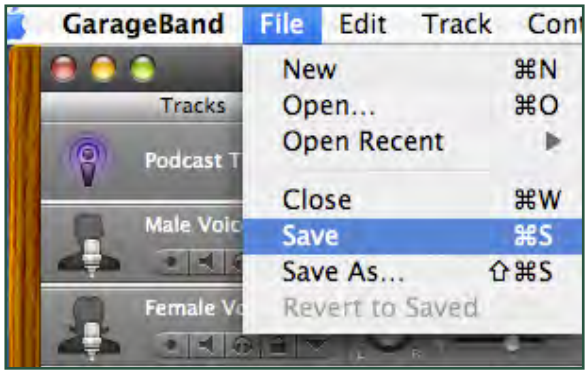
- Click the **Jingles** track to make it active.

- Open your **Project** folder and drag 

the ending.aif file to the **Jingles** track.

- If necessary, drag the audio along the track to reposition it.

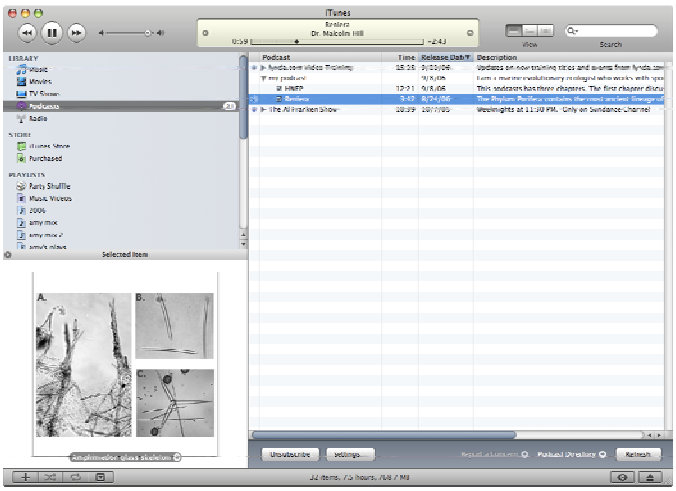
STEP 8. Save your podcast!



STEP 9. Share your podcast.

- Share > Export Podcast to Disk.
- Choose Desktop > Save.
- Back up your GarageBand file AND your .m4a file.
- Upload your .m4a to Blackboard.

STEP 10. Subscribe to your podcast.



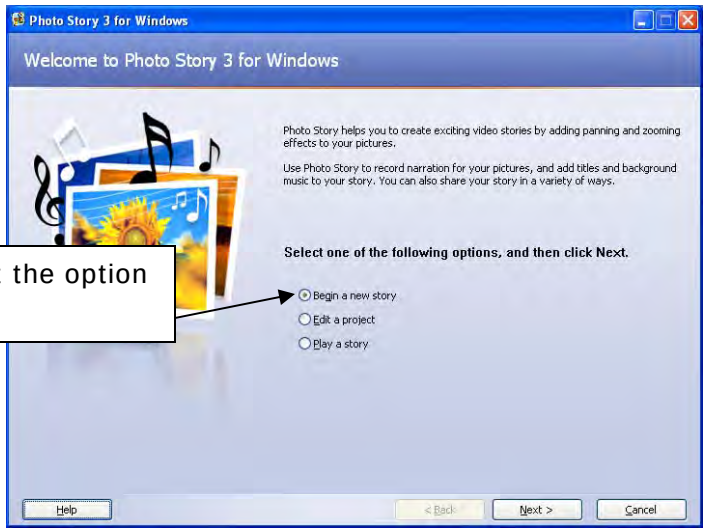
- Open iTunes.
- Choose Advanced > Subscribe to podcast.
- Paste in the URL.
- Back up your GarageBand file AND your .m4a file.
- Upload your .m4a to Blackboard.

Additional Help

Can be found on the Apple website:
http://www.apple.com/ilife/tutorials/garageband/

Creating Enhanced Podcasts using Microsoft Photo Story

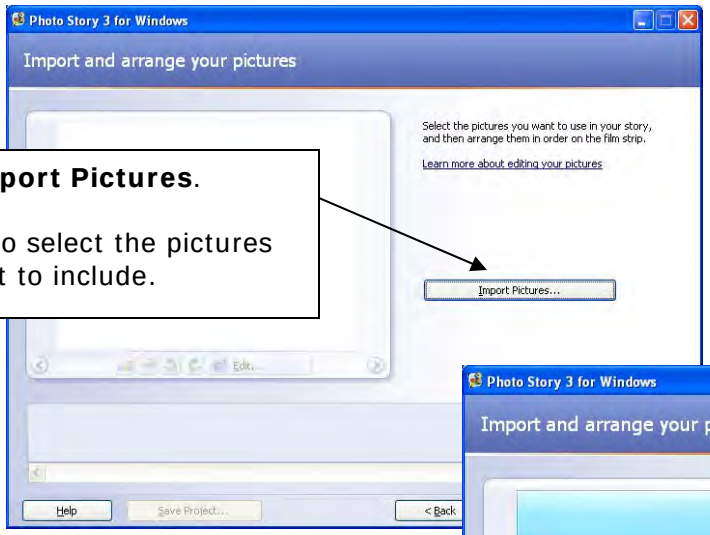
Download Photo Story if you don't have it already (**Photo Story is free**):
http://www.microsoft.com/windowsxp/using/digitalphotography/photostory/default.mspx



Open Photo Story and select the option to begin a new story.

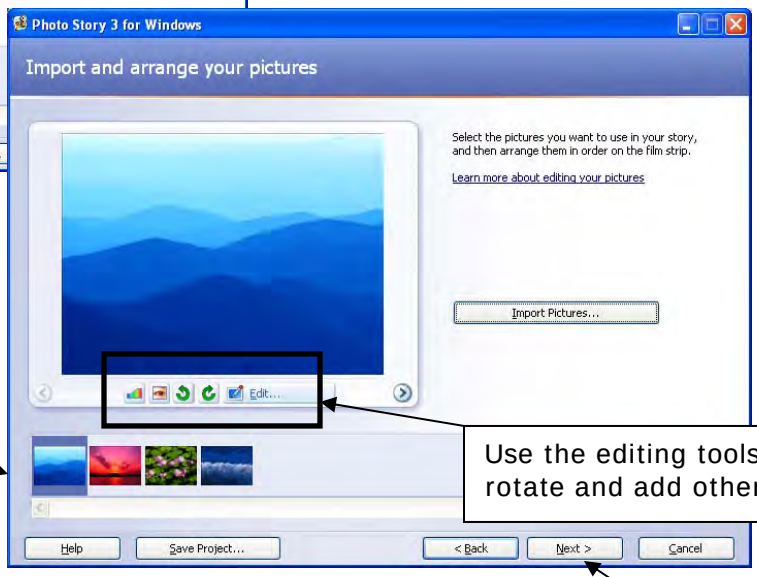
Click **Next**.

ADD PICTURES



Click **Import Pictures**.

Browse to select the pictures you want to include.

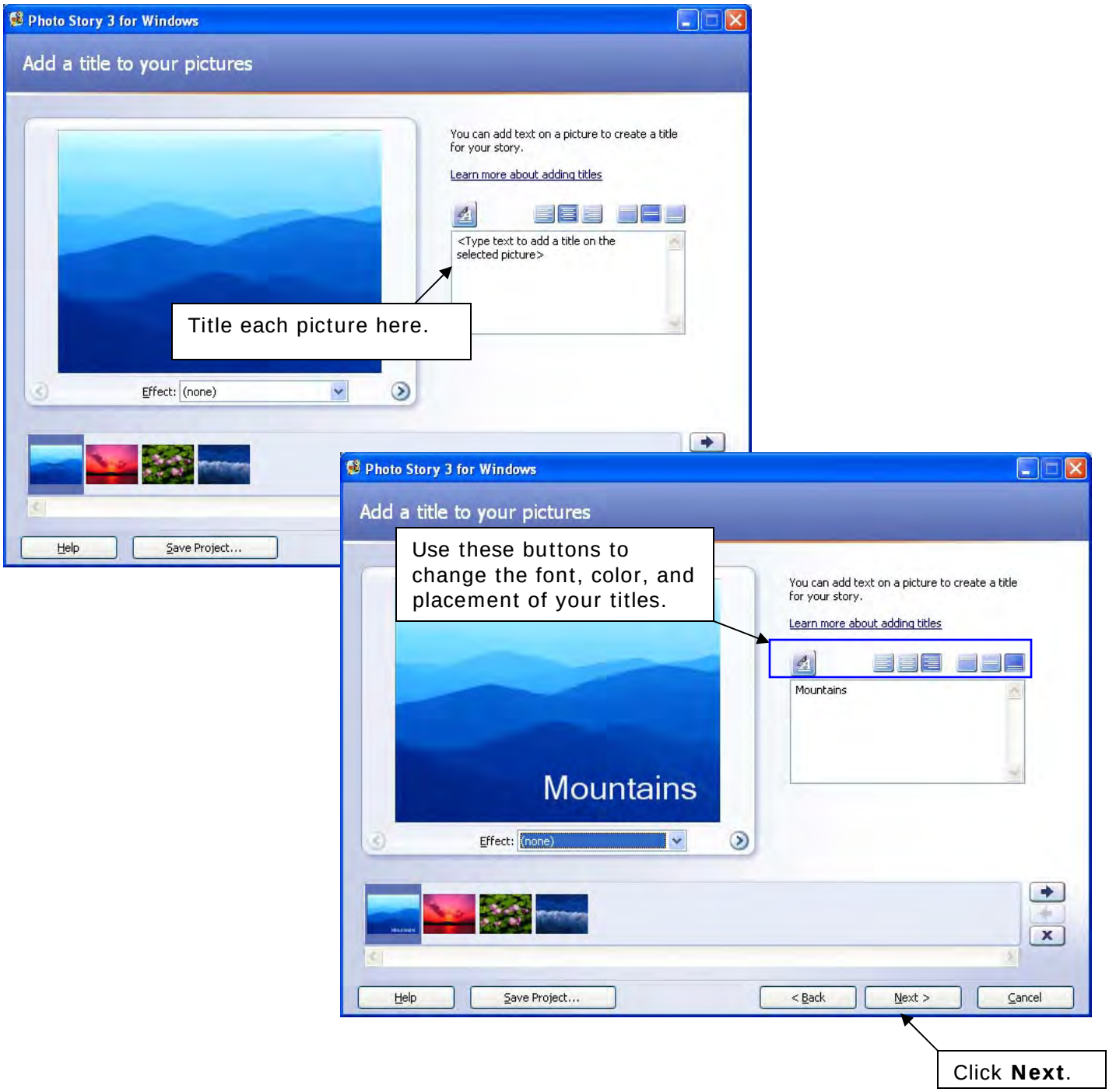


Drag the thumbnails to arrange the order of your pictures.

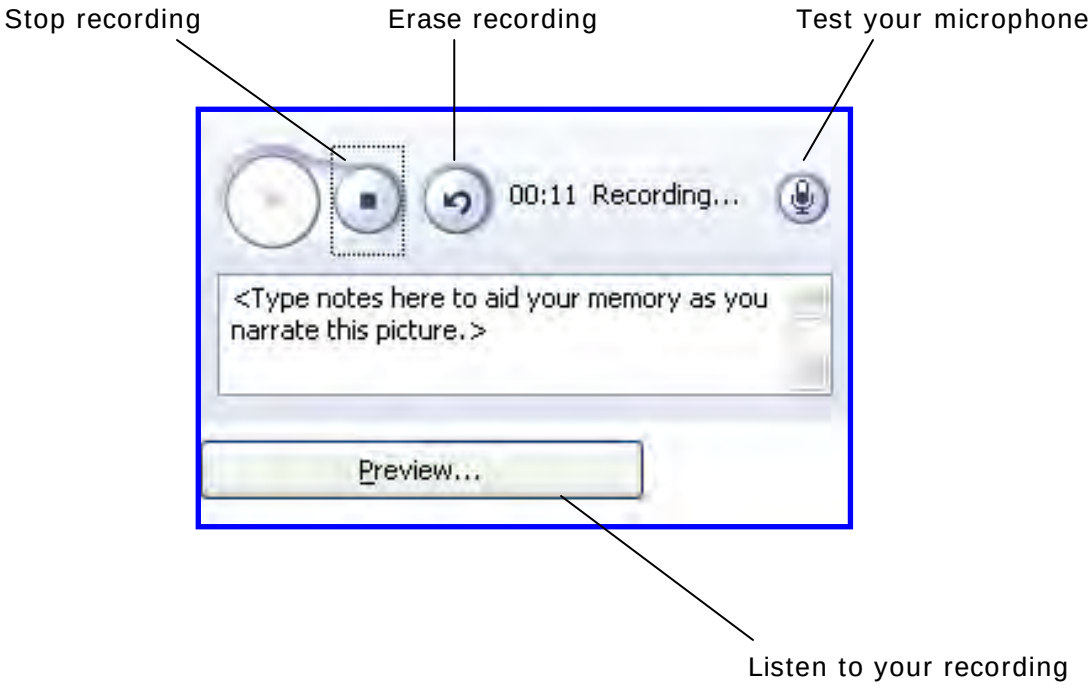
Use the editing tools to crop, rotate and add other effects.

Click **Next**.

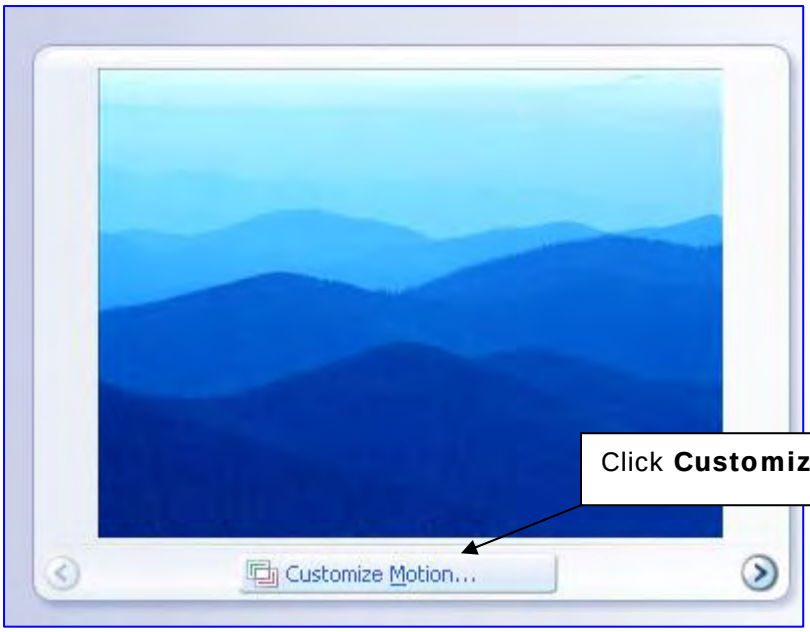
EDIT PICTURES



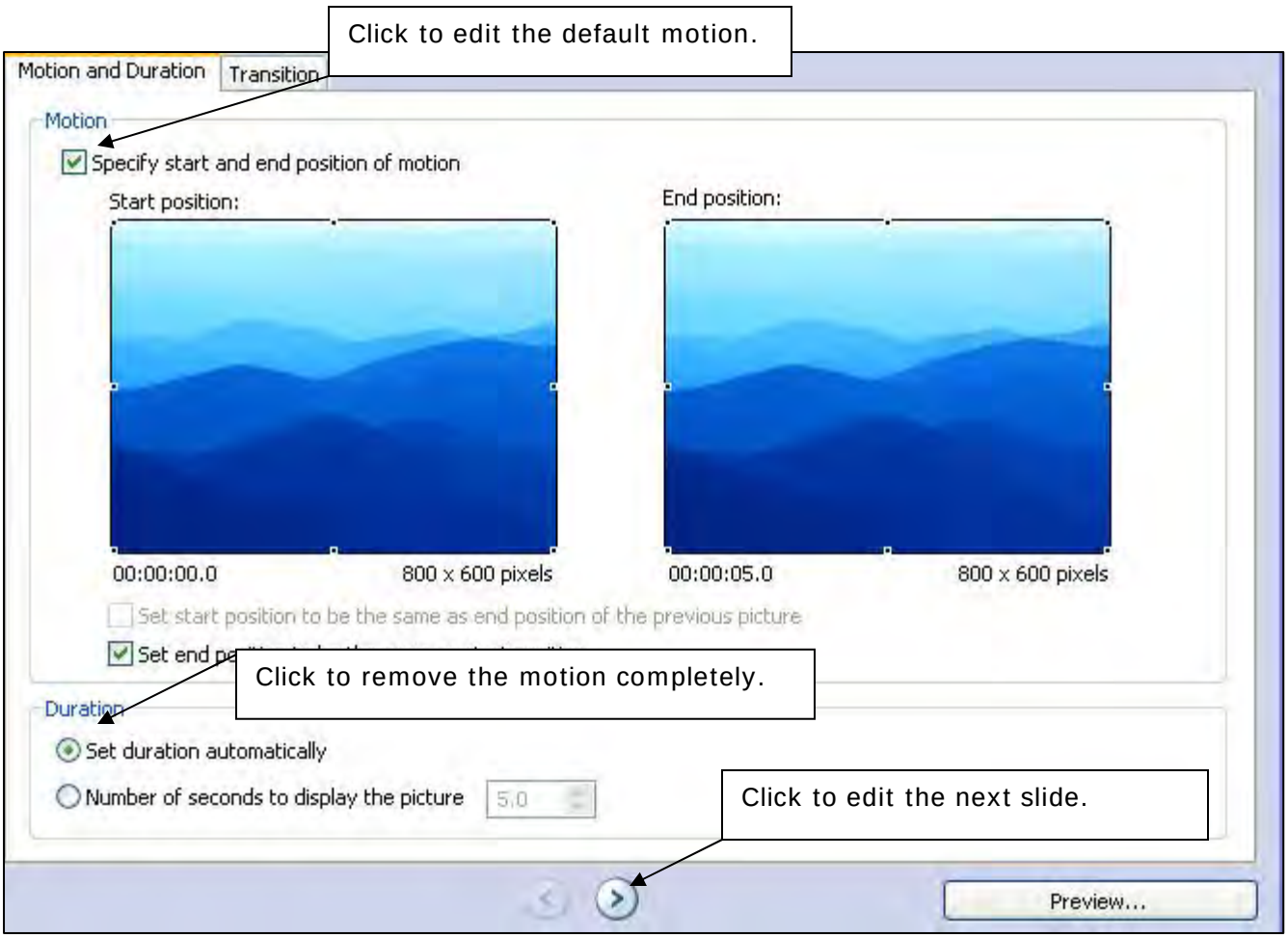
RECORD NARRATION



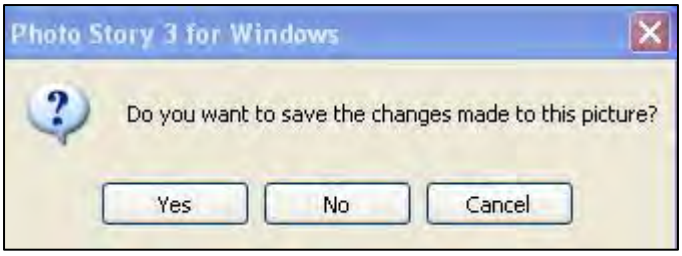
CUSTOMIZE MOTION



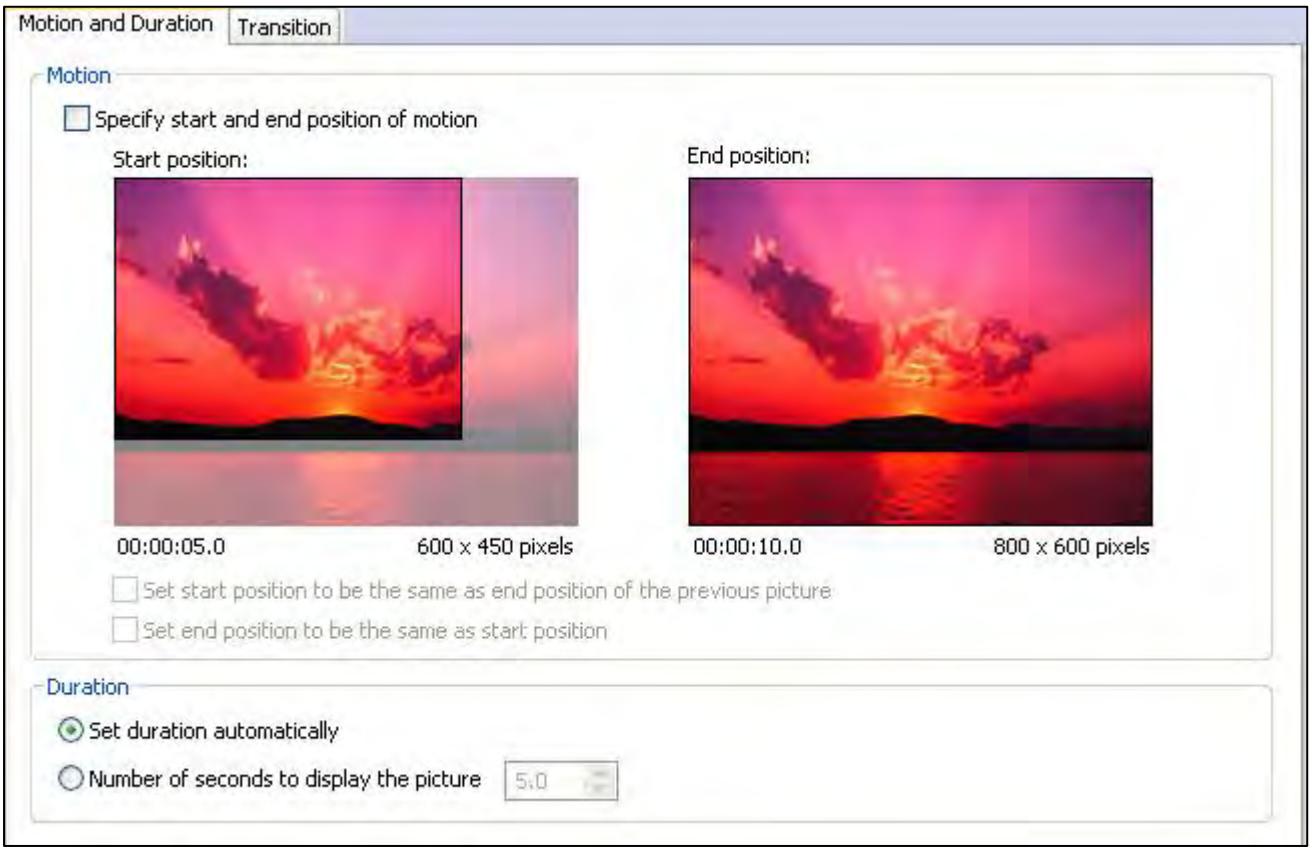
By default, all images include some form of motion.



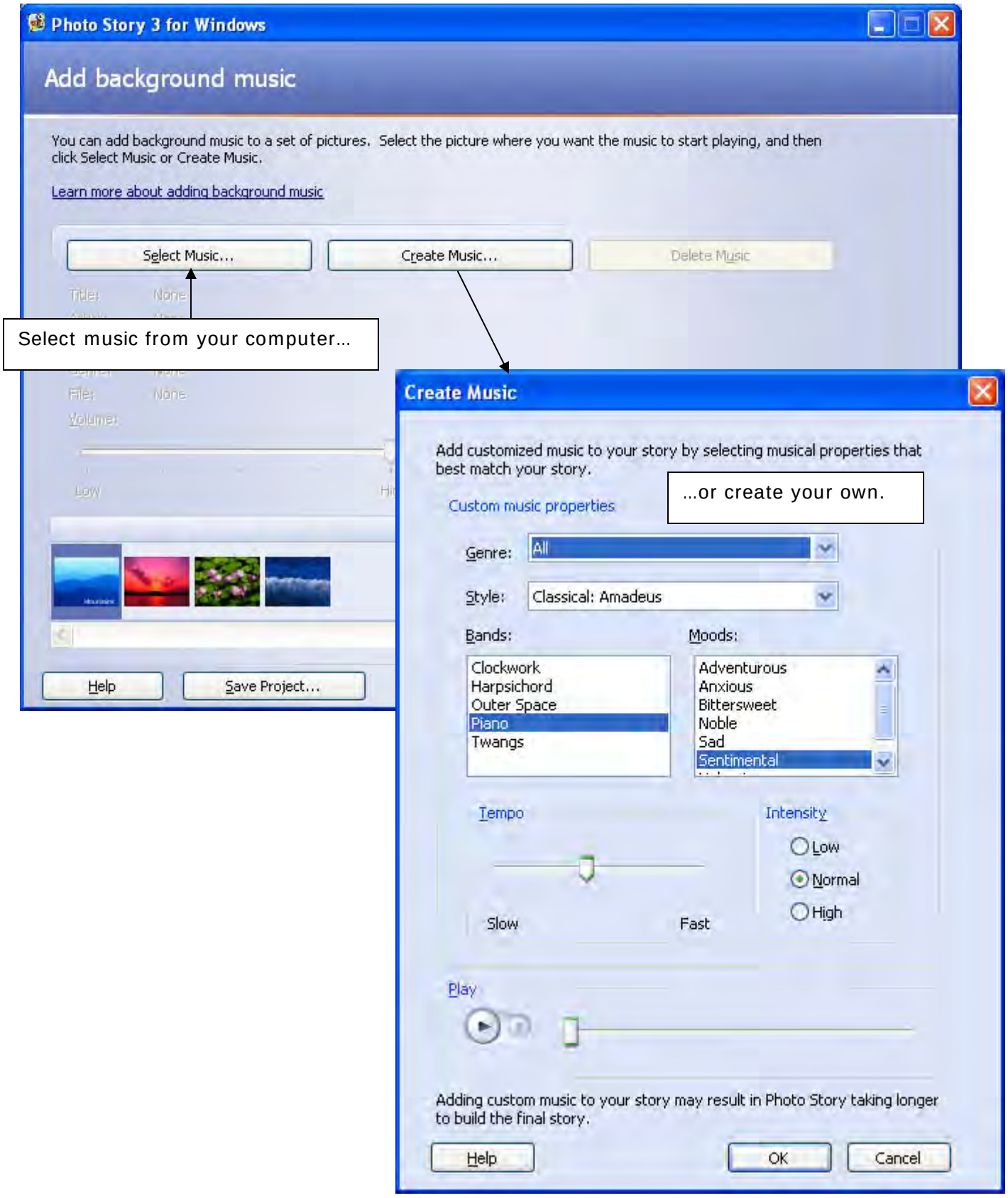
NOTE: You can only apply customized motion to individual slides. To edit multiple slides, you must move between them. When you click the button you will be prompted to save:



Repeat the steps above on the next picture.

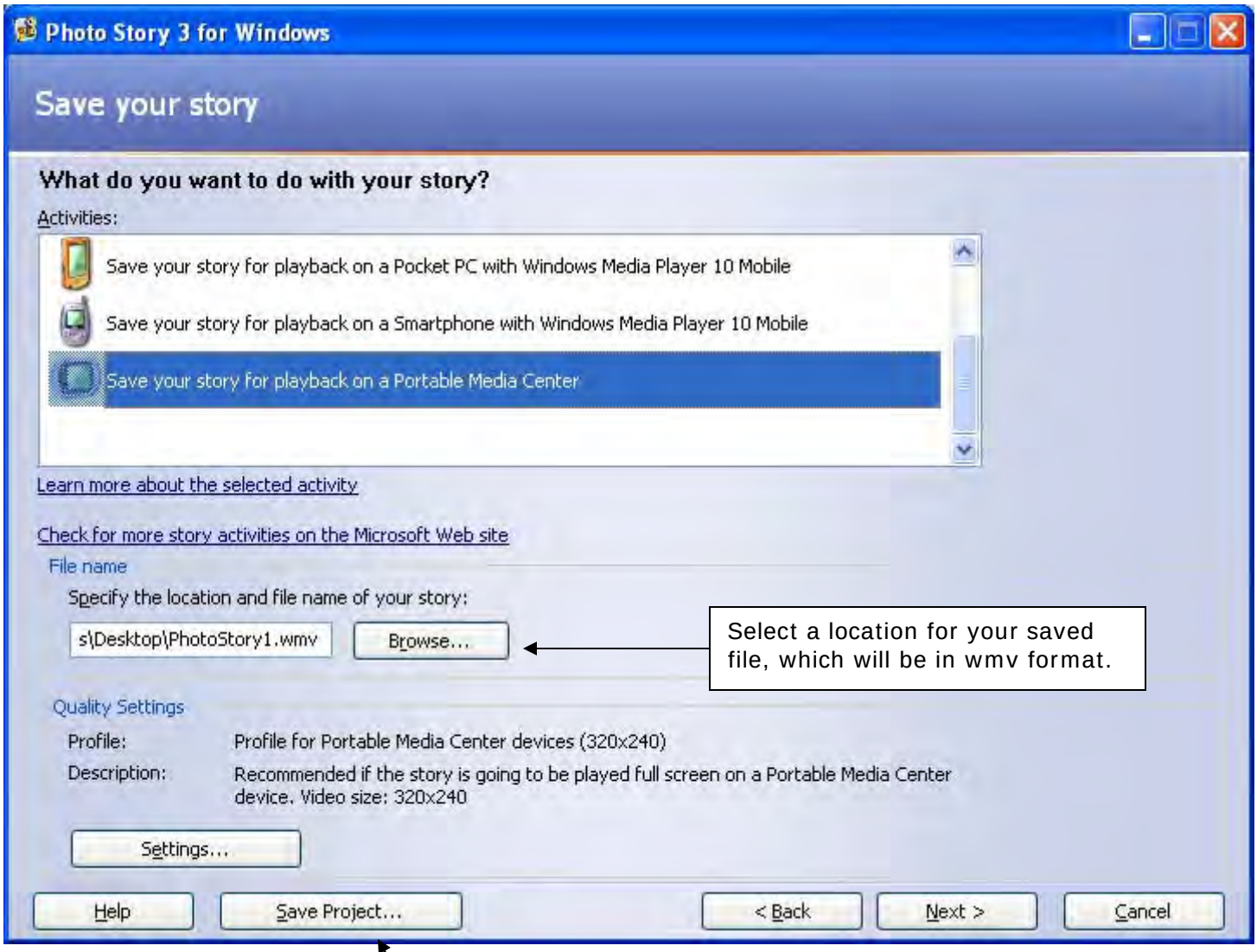


ADD BACKGROUND MUSIC



SAVE YOUR PODCAST

Save your podcast **for playback on a Portable Media Center** so it is sized correctly for the video iPod.



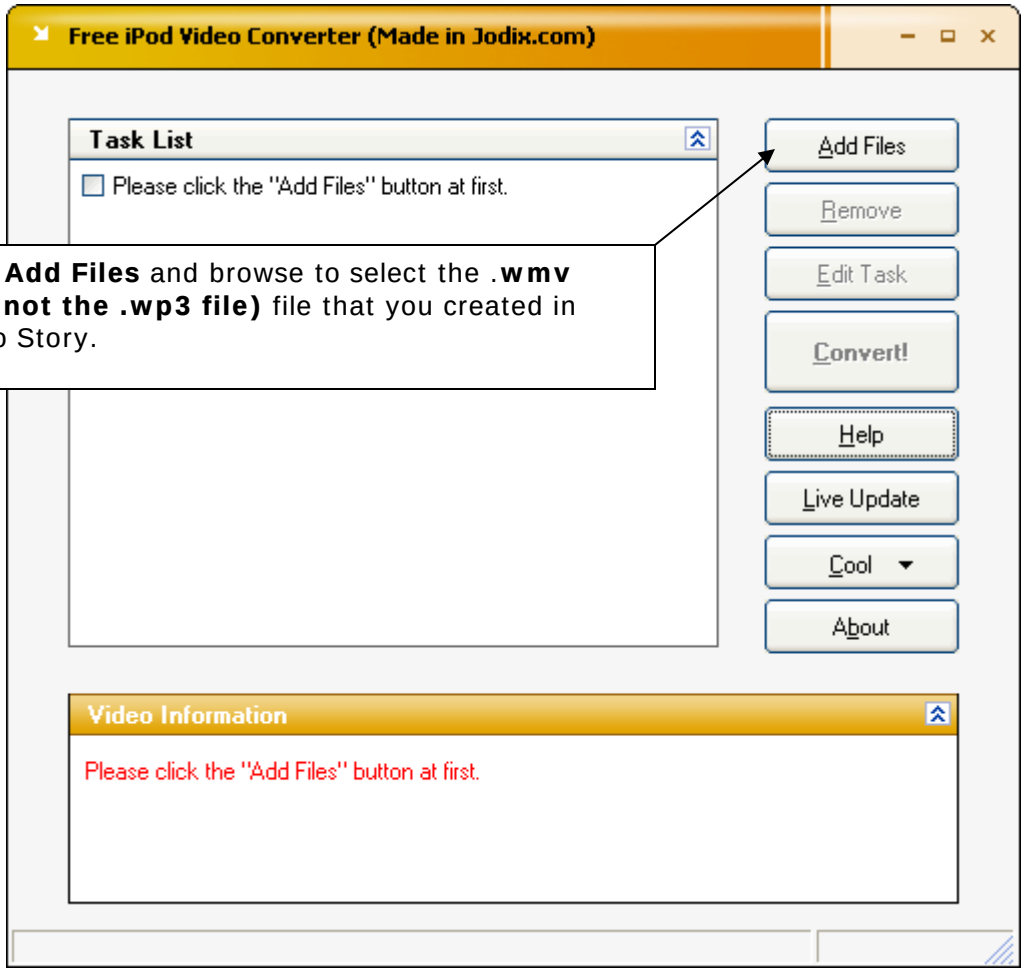
Select a location for your saved file, which will be in wmv format.

Select **Save Project** to save your podcast in its original wp3 format in case you want to edit it later.

CONVERT YOUR PODCAST FOR ITUNES

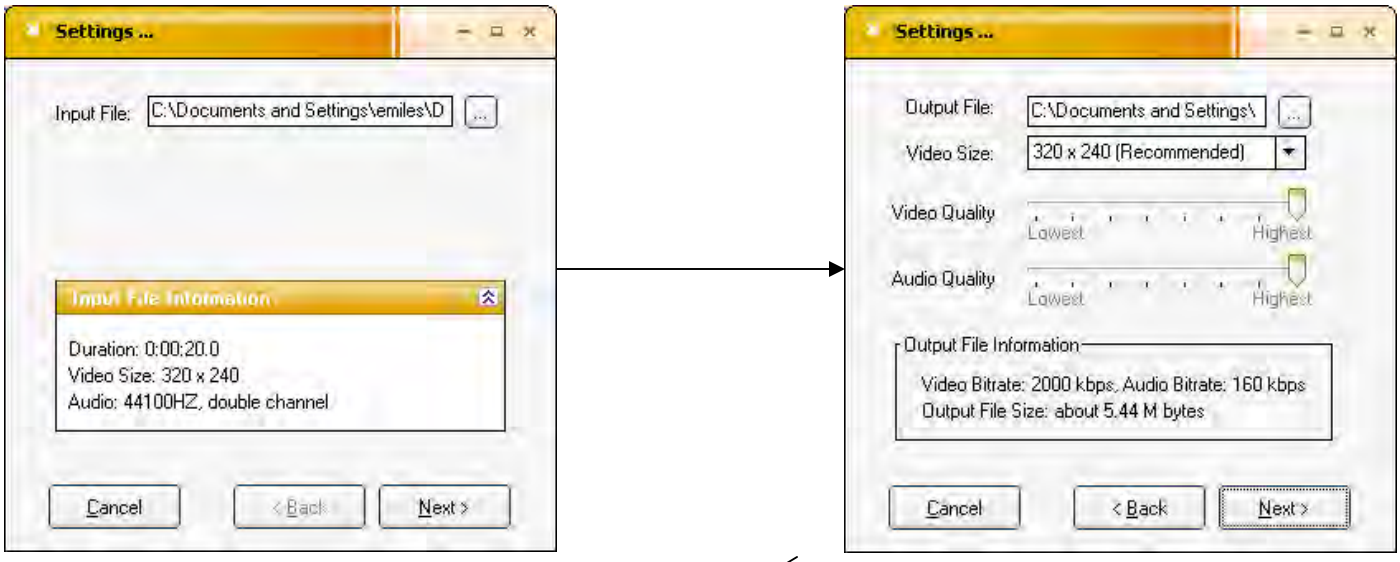
Download and install the free iPod converter from Jodix.com: http://www.ipod-video-converter.org/

Open the software and click **OK**:



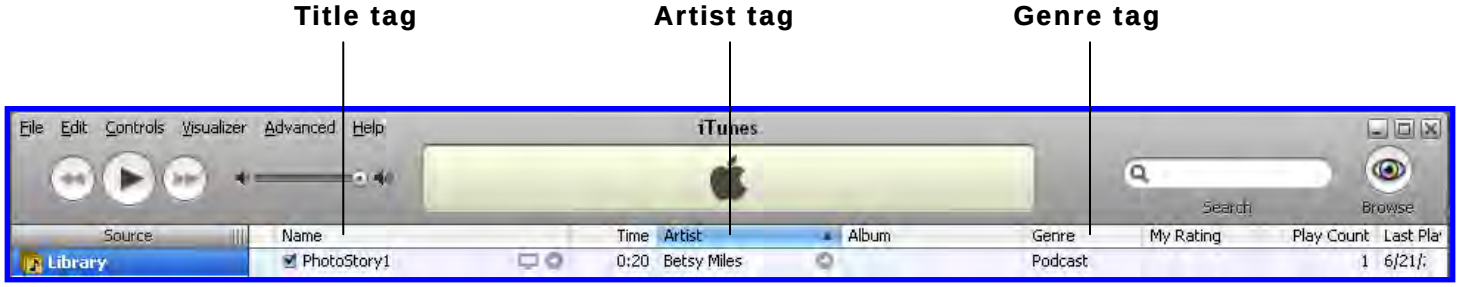
Click **Add Files** and browse to select the **.wmv file (not the .wp3 file)** file that you created in Photo Story.

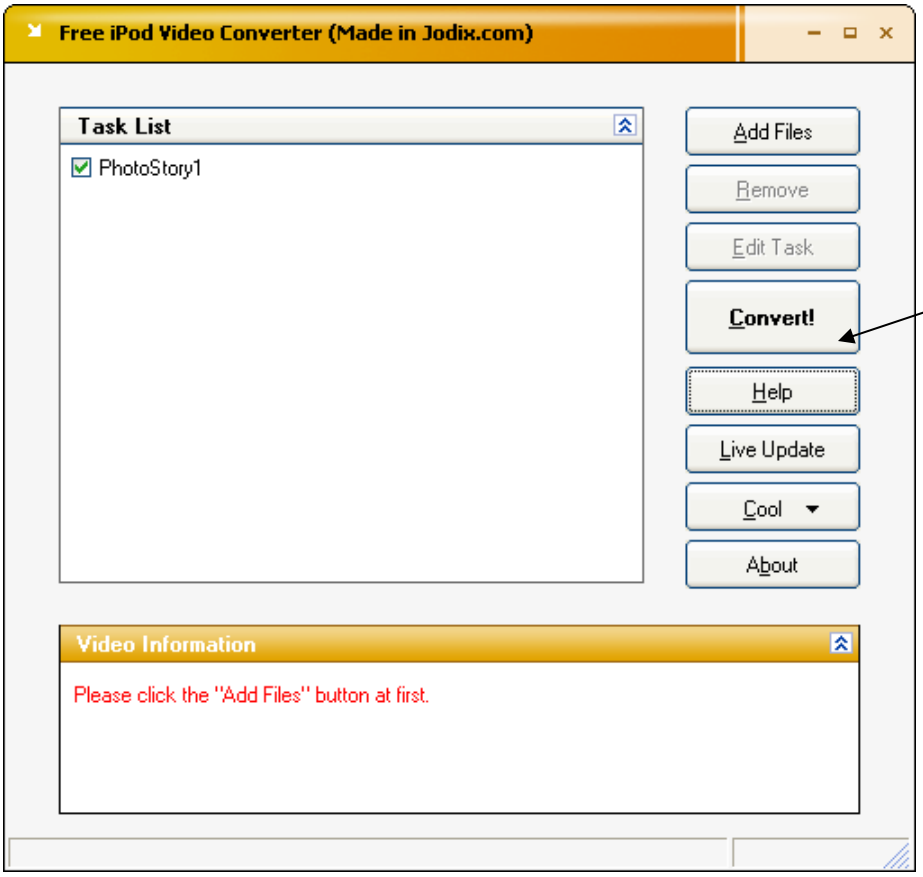
Proceed through the wizard, accepting the defaults:



Add tags:

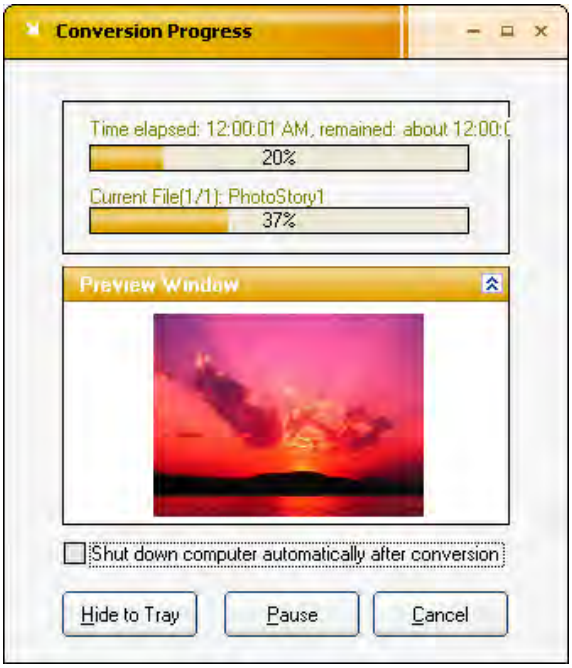
Tags give you the ability to sort and filter content in iTunes.



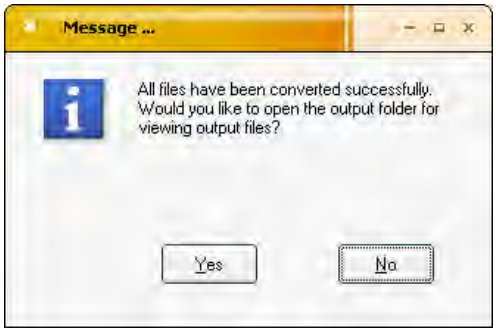


Click **Convert**.

The conversion begins…

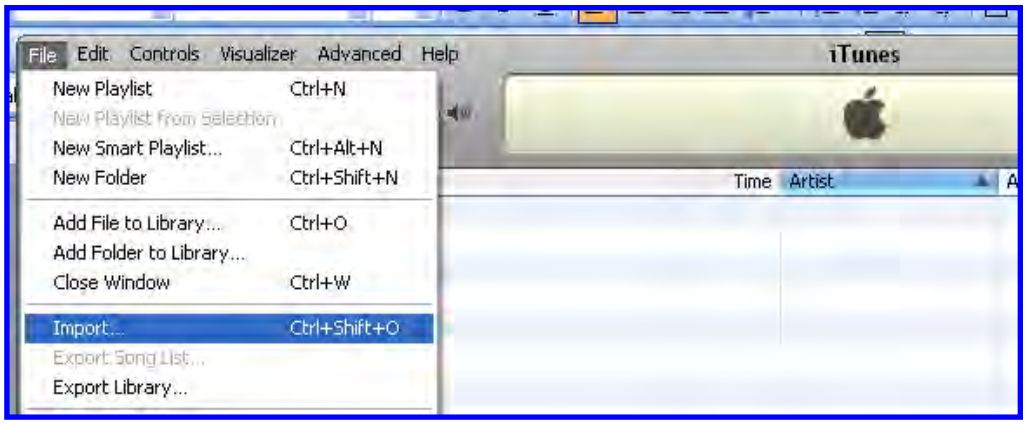


…and this message appears upon completion.



Your converted file extension will be .mp4

Open iTunes, select File > Import and browse to select the converted file:



Your imported podcast will appear in the **iTune's Movies** section:

Podcast Peer Critique Rubric: Example

Rating	Content	Presentation
Exemplary ★★★★★	• Communicates the key aspects of the evolutionary history and ecology of the organism in a clear and simple manner • Is informative • Teaches the listener a lot	• Presents the organism in an interesting and imaginative way with high quality audio and well-chosen visuals • Is very engaging and entertaining • Presents the material within a well-organized and logical manner • Has a clear and understandable audio track throughout
Good ★★★	• Communicates the key aspects of the ecology and evolution of the organism but lacks the depth of an exemplary podcast • Teaches some information	• Presents the organism in an appropriate and relevant way with adequate visuals and audio • Is moderately entertaining • Presents the material in a suitably organized manner • Has a clear and understandable audio track for most of the podcast
Needs improvement ★	• Does not provide sufficient information regarding the evolutionary history and ecology of the organism • Is not sufficiently informative • Teaches very little information	• Presents the organism in a tedious and uninteresting way with poor quality audio and visuals • Is not entertaining • Has content that is unstructured and disorganized. • Has a significant portion (or all) of the audio track that is not clear or understandable

Podcast Grading Rubric: Example

Name: _____ Organism: _____

Storyboard: _____/15 points

Podcast: _____/25 points for CONTENT (see rubric below)

Podcast: _____/25 points for PRESENTATION QUALITY (see rubric below)

Peer critiques: _____/10 points

Total score for podcast project: _____/75 points (7.5% of course grade)

Content rubric

Rating	Accurate	Informative	Interesting
Exemplary 20-25 points	• Key aspects of the evolutionary history and ecology of the organism are accurately communicated • A clear understanding of the material is demonstrated	• Content is very informative • Listener learns why organism is important • Content demonstrates quality research and insight	• Content is interesting and memorable
Good 12-19 points	• Key aspects of the ecology and evolution of the organism are included, but these may be inaccurately communicated in places	• Content is informative • Quality of research and insight is adequate	• Content is interesting
Needs improvement 0-11 points	• Sufficient accurate information regarding the evolutionary history and ecology of the organism is not provided • Content is muddled or misunderstood in many places	• Quality of research and insight is insufficient, lacks depth • Listener does not learn much from the podcast • Some of the information may be irrelevant or inappropriate	• Content is tedious and uninteresting • Content is too basic

Presentation rubric

Rating	Clarity	Overall audio and visual effect	Flow & Organization
Exemplary 20-25 points	• Content is communicated in a clear and simple manner • Key points are easy to extract from the presentation • Audio track is clear and understandable throughout • Narration is smoothly delivered with a conversational style	• Organism is presented in an interesting and imaginative way with high quality audio and well-chosen visuals • Presentation is catchy, clever, and/or creative • Presentation is very engaging and entertaining • Music enhances the quality of the podcast	• Material is presented in a well-organized and logical manner • Podcast has a good pace and flow • Transitions are smooth and spaced correctly
Good 12-19 points	• Organism is presented in an appropriate and relevant way • Key points are easy to follow and understand. • Smooth delivery of narration	• Presentation is moderately entertaining with some original and creative elements • Good quality images • Audio track is clear and understandable for most of the podcast • Music is used effectively	• Content is suitably organized and fairly easy to follow and understand • Transitions are smooth
Needs Improvement 0-11 points	• Key points are hard to follow • A significant portion (or all) of the audio track is not clear or understandable • Unrehearsed and uneven delivery	• Organism is presented in a tedious and uninteresting manner • Presentation does not engage the listener • Poor quality images • Music is used in a manner that distracts from the content	• Content is unstructured and disorganized • Transitions are uneven and awkward