**MULTIMEDIA INSTRUCTION FOR THE MIDDLE SCHOOL**

**MATHEMATICS CLASSROOM: A FIVE-HOUR WORKSHOP**

****

**By Jesus Berrios**

**August 13, 2010**

**TABLE OF CONTENTS**

**OVERVIEW --------------------------------------------------- 3**

**AGENDA -------------------------------------------------------- 5**

**PRE-TRAINING GLOSSARY ------------------------------ 6**

**PRE-TRAINING CROSSWORD ---------------------------- 8**

**MULTIMEDIA THEORY ------------------------------------ 10**

**MULTIMEDIA PRINCIPLES ------------------------------- 11**

**WIKIS -------------------------------------------------------------- 13**

**PROJECT --------------------------------------------------------- 14**

**ASSESSMENT & RUBRIC ------------------------------------ 15**

**MATERIALS & RESOURCES ------------------------------- 17**

**OVERVIEW**

**﻿**WHAT FOLLOWS IS A 5-HR WORKSHOP FOR MIDDLE SCHOOL MATHEMATICS EDUCATORS. ITS PURPOSE IS TO PRESENT YOU WITH THE THEORY, INSTRUCTIONAL PRINCIPLES, AND NEW TECHNOLOGIES THAT TOGETHER WILL FACILITATE DELIVERY OF EFFECTIVE MULTIMEDIA INSTRUCTION IN YOUR MATHEMATICS CLASSROOMS.

IN THIS REGARD, BY THE END OF THIS WORKSHOP YOU WILL HAVE DESIGNED A 90-MINUTE MULTIMEDIA MATHEMATICS LESSON SPECIFIC TO A PARTICULAR MIDDLE SCHOOL GRADE LEVEL OF YOUR CHOICE. THEREIN YOU WILL DEMONSTRATE ATTAINMENT OF THE REFERENCED OBJECTIVES; THAT IS, UNDERSTANDING OF THE COGNITIVE THEORY OF MULTIMEDIA LEARNING, THE PRINCIPLES OF MULTIMEDIA INSTRUCTION, AND THE SKILLS NECESSARY FOR THE VIABLE USE OF EDUCATIONAL TECHNOLOGY IN MULTIMEDIA MIDDLE SCHOOL MATHEMATICS LESSON PLANNING.

TO THIS END, A COLLABORATIVE GROUP PROJECT WILL BE ASSIGNED THAT WILL SERVE AS AN AUTHENTIC ASSESSMENT ACTIVITY (THE PROJECT). THE PROJECT WILL BE PEER-EVALUATED USING AN ESTABLISHED RUBRIC (SEE RUBRIC HANDOUT).

IT IS OF NOTE THAT THE PROJECT ASSIGNMENT WILL INVOLVE THE CONSTRUCTION AND DESIGN OF GROUP WIKIS. SINCE THIS WORKSHOP ITSELF USES THE WIKI AS ITS CENTRAL EDUCATIONAL TECHNOLOGY, I STRONGLY RECOMMEND THAT YOU USE IT AS A MODEL FOR YOUR OWN PRESENTATIONS. PAY PARTICULARLY CLOSE ATTENTION TO HOW IT LINKS TO, AND ORGANIZES ITS PAGES AND RESOURCES.

IN THE TRUE SPIRIT OF MULTIMEDIA LEARNING,THIS WORKSHOP DELIVERY EMPHASIZES SPOKEN AND VISUAL CONTENT, BUT PRINTED TEXT FORMATS TOO, ARE AVAILABLE IN BOTH THE WIKI HANDOUT PAGES AND IN DOWNLOADABLE PDF FORMAT FOR HARD-COPY PRINTING.

THE HOME PAGE WILL LEAD YOU THROUGH FOUR (4) SPOKEN AND VISUAL COMPONENTS, THE FIRST OF WHICH IS THIS OVERVIEW, THAT ARE PERFECTLY ALIGNED WITH THE WIKI HANDOUT PAGES AND ITS DOWNLOADABLE VERSION. IN THIS WAY YOU CAN SEE AND LISTEN WHILE REFERRING TO THE PRINTED WORD IF NECESSARY.

MAKE SURE YOU USE THE PAUSE AND REVIEW FEATURES IN THESE VIDEO PRESENTATIONS SO AS TO FACILITATE NOTE-TAKING ONTO THE PRINTED FORMS AS NECESSARY.

AS A FINAL NOTE, WHILE IN ITS CURRENT FORM THIS WORKSHOP FOCUSES ON MIDDLE SCHOOL MATHEMATICS INSTRUCTION, ITS CONTENT CAN BE APPLIED ACROSS DISCIPLINES AND GRADE LEVELS.

GOOD LUCK.

**AGENDA**

OVERVIEW (15 MINUTES)  
COGNITIVE THEORY OF MULTIMEDIA LEARNING (15 MINUTES)  
MULTIMEDIA INSTRUCTION PRINCIPLES (15 MINUTES)  
WIKI TUTORIAL (15 MINUTES)  
THE PROJECT (2 HOURS)  
ASSESSMENT (2 HOURS)  
THE RUBRIC

THE MATERIALS  
THE RESOURCES﻿

**THE PRE-TRAINING ACTIVITY**

\* USE THE GLOSSARY TO COMPLETE THE CROSSWORD

**MULTIMEDIA LEARNING GLOSSARY**

**active processing –** the assumption that humans engage in active learning by attending to relevant incoming information, organizing selected information into coherent mental representations, and integrating mental representations with other knowledge.

**coherence –** a principle that reduces extraneous processing by deleting unnecessary words, sounds, or graphics.

**dual channels –** the assumption that humans possess separate channels for processing visual and auditory information.

**essential -**  cognitive processing required to represent the essential material in working memory.

**extraneous –** cognitive processing that does not serve the instructional goal.

**generative –** cognitive processing required for deeper understanding.

**image –** a technique that promotes generative processing and states that presenting a speaker’s image on the screen can result in extraneous processing.

**limited capacity –** the assumption that humansare limited in the amount of information that they can process in each channel at one time.

**modality -** a way to manage essential processing by presenting lessons that use pictures and spoken words rather than pictures and printed words.

**multimedia –** the simultaneous use of various communications media to facilitate learning.

**multimedia principle -**  a technique that promotes generative processing and states that people learn better from words and pictures than words alone.

**personalization -** a technique that promotes generative processing by presenting speech in conversational style rather than formal style.

**pre-training -** a way to manage essential processing by preceding a lesson with the names and characteristics of key components.

**redundancy -** a principle that reduces extraneous processing by deleting redundant captions from narrated animation.

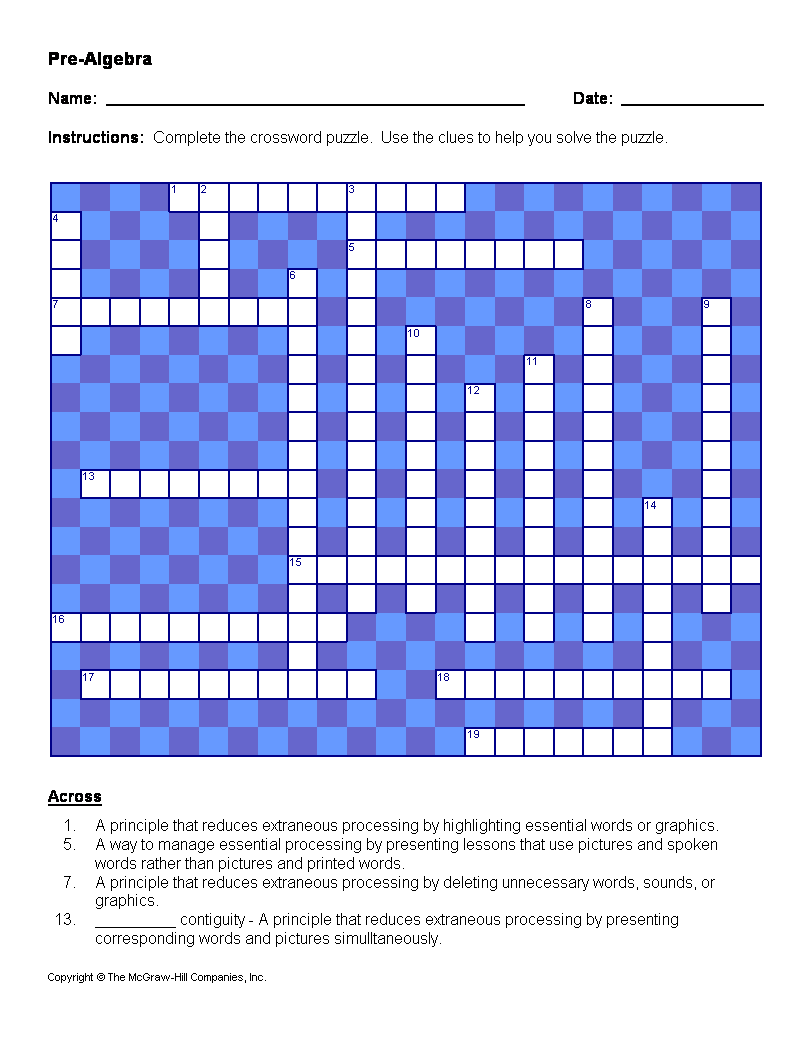
**segmenting –** a way to manage essential processing by presenting lessons in user-paced segments rather than as a continuous unit.

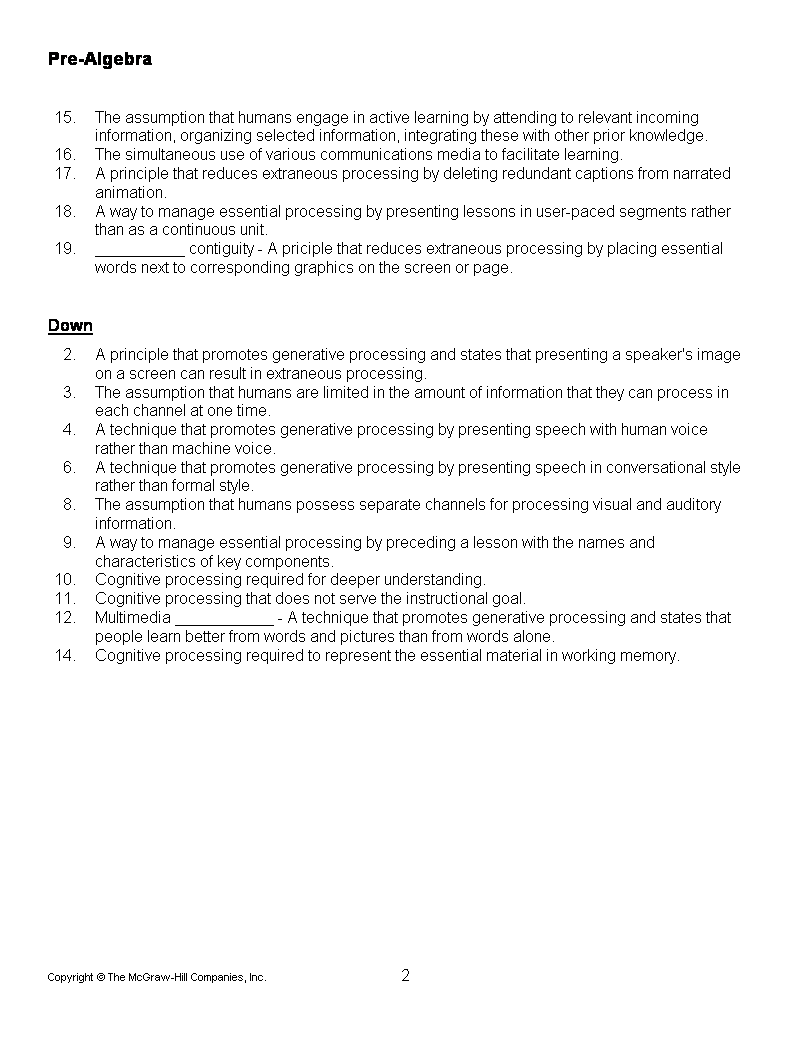
**signaling -** a principle that reduces extraneous processing by highlighting essential words or graphics.

**voice -** a technique that promotes generative processing by presenting speech with human voice rather than machine voice.

**spatial contiguity -** a principle that reduces extraneous processing by placing essential words next to corresponding graphics on the screen or page.

**temporal contiguity -** a principle that reduces extraneous processing by presenting corresponding words and pictures simultaneously.





**THE COGNITIVE THEORY OF MULTIMEDIA LEARNING**

Multimedia Learning Theory is based on three (concepts) from the Cognitive Sciences: These are Dual Channels, Limited Capacity, and Active Processing.

* Dual Channels states that the individual takes in external information through the ears (auditory channel) and the eyes (visual channel).
* Limited Capacity states that the individual’s working memory is limited in the amount of information he/she can make sense of at one time.
* Active Processing states that the individual undergoes an active process that attempts to *selec*t essential information, *organize* it into logical knowledge structures, and then *integrates* these into the prior knowledge in long-term memory.

**MULTIMEDIA LEARNING THEORY**

DUAL CHANNELS LIMITED CAPACITY ACTIVE LEARNING

# MAYER'S TRIARCHIC MODEL OF COGNITIVE LOAD MULTIMEDIA THEORY AND INSTRUCTIONAL PRINCIPLES

## I. EXTRANEOUS COGNITIVE PROCESSING

### *A. TEMPORAL CONTIGUITY = People learn better when corresponding words and pictures are presented simultaneously rather than successively.*

### *B. REDUNDANCY = People learn better from graphics and narration than from graphics, narration, and printed text.*

### *C. COHERENCE = People learn better when irrelevant words, pictures, sounds and music are excluded from multimedia presentations.*

### *D. SPATIAL CONTIGUITY = People learn better when corresponding words and pictures are presented near rather than far from each other on the page or screen.*

### *E. SIGNALING = People learn better when cues that highlight the organization of the essential material are added.*

## II. ESSENTIAL COGNITIVE PROCESSING

### *A. SEGMENTING = People learn better when a multimedia message is presented in user-paced segments rather than as a continuous unit.*

### *B. PRE-TRAINING = People learn more deeply from a multimedia message when they know the names and characteristics of the main concepts.*

### *C. MODALITY = People learn more deeply from pictures and spoken words than from pictures and printed words.*

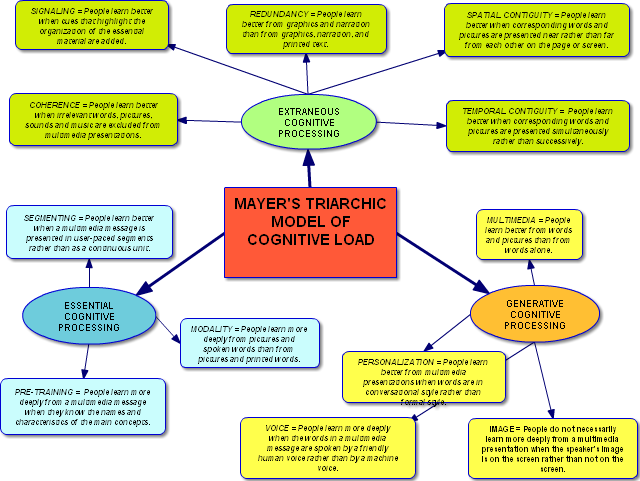
## III. GENERATIVE COGNITIVE PROCESSING

### *A. MULTIMEDIA = People learn better from words and pictures than from words alone.*

### B. IMAGE = People do not necessarily learn more deeply from a multimedia presentation when the speaker's image is on the screen rather than not on the screen.

### *C. PERSONALIZATION = People learn better from multimedia presentations when words are in conversational style rather than formal style.*

### *D. VOICE = People learn more deeply when the words in a multimedia message are spoken by a friendly human voice rather than by a machine voice.*



**WIKIS**

A *wiki* is a website (such as those highlighted in your wiki tutorial) that allows the easy creation and editing of an number of interlinked web pages.

Wikis are typically powered by wiki software and are often used to create collaborative wiki websites, to power community websites, for personal note taking, in corporate intranets, and knowledge management systems.

Wikis can exist to serve a specific purpose, and in such cases, users use their editorial rights to remove material that is considered “off topic.” A good example of this form is *Wikipedia.com.*  In contrast, open purpose wikis, like those that you will design in your project, accept content without firm rules as to how the content should be organized (it will all be up to you).

http://en.wikipedia.org/wiki/Wiki

**THE PROJECT**

* Workshop participants will be assigned to groups of four.
* Each group will be charged with constructing and designing a ninety-minute multimedia mathematics lesson on a wiki.
* Each member will contribute a multimedia activity (concept maps, audio/video, etc.) that fulfills one of the four project activity modules, that is, a ‘Do Now’ pre-activity, an introductory presentation activity, a skill building activity, and an authentic assessment activity.
* One participant in each group will set up a wiki, give it a name, and invite the instructor and other group members by using the individuals’ email addresses (see tutorial).
* Once the wiki *home* page is set up, the group will decide on the lesson content and assignment of group member multimedia activity modules.
* Each group member, including the original organizer, will set up their own page within the wiki. Each page will include the individual member’s first name and the activity module they will be constructing within that page, e.g. *John – Do Now.*
* All project wikis will include a lesson plan page and a page for the rubric that will be used to measure the authentic assessment activity.
* The finished project will be presented to the workshop participants for peer-review according to the workshop rubric prescribed herein (see Rubric Page).
* The finished product will demonstrate knowledge and application of multimedia learning theory, instructional principles, and educational technology.

**PEER ASSESSMENT**

Each Project will be presented to the workshop audience within the last two hours of the workshop. Each other group will grade the presentations according to the rubric below. I will also grade the presentations in this manner. The final grade will be an average of all assessments.

**﻿RUBRIC**

﻿   
  
  
Definitions of Ratings: Quality Indicators   
  
  
  
5 = Acceptable as is, the level of scholarship demonstrates critical thinking and a mastery of all crucial elements.  
4 = Acceptable as is, all crucial elements are included and adequately described.  
3 = Approved, although revisions are strongly suggested in one or more important component(s) that are of markedly lesser quality than the rest of the quality indicators in this section.  
2 = Must be revised and resubmitted because one or more essential component(s) are not satisfactorily described.  
1 = Must be revised and resubmitted because one or more required element(s) are missing or previous requests for revision were ignored.  
NA = Not Applicable. This quality indicator does not apply to the document.

|  |  |
| --- | --- |
| **Multimedia Mathematics Lesson Project ( 75 points)** | |
| **Planning the Multimedia Lesson (15 points)** | |
| * Wiki: Created a wiki as a workspace * Invitation: Invitation sent to instructor and other group members to join wiki |  |
| Topic: An engaging lesson that requires the development of an authentic, problem-based design by your group was selected and posted in the wiki. |  |
| Lesson Plan & Outcomes: A Lesson Plan that includes outcomes was presented. |  |
|  |  |
| **Designing the Multimedia Lesson (10 points)** | |
| Overall Design: You identified the project lesson your group will present and the use of multimedia tools. (in wiki) |  |
|  |  |
| Page Design: You identified all pages as per Project Instructions. |  |
| **Activity Modules (20 points)** | |
| Do Now: Multimedia Theory, Instruction, and use of Technology were demonstrated. |  |
| Introductory Presentation: Multimedia Theory, Instruction, and use of Technology were demonstrated. |  |
| Skills: Multimedia Theory, Instruction, and use of Technology were demonstrated. |  |
| Authentic Assessment: Multimedia Theory, Instruction, and use of Technology were demonstrated. |  |
| **Miscellaneous Considerations (30 points)** |  |
| The following are included in your wiki project: |  |
| List of Technology and equipment needed for your lesson (projector, screen, laptops, other?) |  |
|  | * List of Resources needed for your lesson (your responsibility to bring) * List of Resources provided by site * List of Online Applications you will use in workshop * Other? |  |
| In the media you created for your workshop, you used at least three of the four categories of media presented in the multimedia. You used: \*  Graphics and text   * Text to audio, or audio to text * Video, animations, and cartoons * Virtual Worlds * Other? |  |  |
| You included all the handouts you expect to use in your Multimedia Lesson |  |  |
| The multimedia materials developed for this workshop met the multimedia principles of Mayer: \*  Principles for Reducing Extraneous Processing |  |  |
| The multimedia materials developed for this workshop met the multimedia principles of Mayer: \*  Principles for Managing Essential Processing |  |  |
| The multimedia materials developed for this workshop met the multimedia principles of Mayer: \*  Principles for Fostering Generative Processing |  |  |
|  | |  |
|  |  |  |
|  |  |  |
| **Total Points** | **out of 75** |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

**MATERIALS**

* 1 lg. Interactive Whiteboard (IWB) w/projector
* Laptops w/Internet connectivity for all participants (including presenter/instructor
* LinQ software on all laptops
* Wireless router
* All free necessary online multimedia software applications are downloaded and installed on all laptops
* Handout hard copy for all participants

**RESOURCES**

**Instant Message Application:** [Skype](http://www.skype.com/)  
Please set up a Skype account for communication with class members and your Instructor outside of class. Post your Skype name in the **Class Café** so that others can add you to their account.  
**Social Bookmarking Sites:** [Delicious](http://del.icio.us/) or [Diigo](http://www.diigo.com/)  
Please create either a Delicious or a Diigo account to share your virtual bookmarks for the course with others in the class. You can “bundle” your sites by the tags that you create for your themes. If you create both a Delicious and a Diigo account, you can link them.  
For more information about how social bookmarking sites work, watch this brief video on the Common Craft Show: [Social Bookmarking in Plain English](http://commoncraft.com/bookmarking-plain-english).  
**Social Networking Sites:**  
[Facebook](http://www.facebook.com/), [Friendster](http://www.friendster.com/), [MySpace](http://www.myspace.com/), [LinkedIn](http://www.linkedin.com/) – These sites allow you to join and create your own personal page. You are able to post photos, videos, and comments as well as connect and network with others online.  
For more information about how social bookmarking sites work, watch this brief video on the Common Craft Show: [Social Networking in Plain English](http://www.youtube.com/watch?v=6a_KF7TYKVc).  
**Mind Mapping Resources:** [Spinscape](http://www.spinscape.com/features); [IHMC Cmap](http://cmap.ihmc.us/download/); [Webspiration](http://mywebspiration.com/); [Bubbl.us](http://www.bubbl.us/index);[FreeMind](http://freemind.sourceforge.net/wiki/index.php/Main_Page)  
Mind mapping Web sites provide an alternative to proprietary software such as Inspiration® and can be used to create graphic organizers and share them with collaborators.  
**Collaboration Resources:** [Google Groups](http://groups.google.com/); [Google Docs](https://www.google.com/accounts/ServiceLogin?service=writely&hl=en&passive=true&continue=http%3A%2F%2Fdocs.google.com%2F&ltmpl=WR_tmp_2_lfty&nui=1&utm_campaign=en&utm_source=en-et-more&utm_medium=more); [Elluminate](http://www.elluminate.com/vroom/register.go); [Dimdim 5](http://www.dimdim.com/)  
These resources will allow you to collaborate asynchronously or synchronously so groups can meet and construct artifacts despite the distance among group members. Each of these resources works differently and provides different options. Elluminate allows groups of 3 or fewer to use their webinar program free of charge. Dimdim allows groups of 20 or fewer to use their webinar program free of charge. Google is always free but does provide simultaneous conferencing interactivity.  
Never used a webinar or whiteboard application to collaborate before? Check out these [videos](http://www.dimdim.com/products/dimdim-video-tour.html) discussing the features of Dimdim.  
**Productivity Bundle:** [OpenOffice Suite](http://www.openoffice.org/)  
You will need to have, at a minimum, a word-processing software such as Microsoft Word. If you do not have productivity software, or if you use a word-processing software that is uncommon, you can download a free suite called OpenOffice that has a very similar layout to Microsoft Office. The software bundle includes a word processor, a spreadsheet application, and a presenter application similar to PowerPoint.  
**Note:** In order to avoid compatibility issues, please save your work as ".doc", ".docx", or ".rtf" files.  
**Blog Sites:** [blogger.com](http://www.blogger.com/Start); [classblogmeister.com](http://classblogmeister.com/); [wordpress.com](http://wordpress.com/); [teachersfirst.com](http://www.teachersfirst.com/)  
For more information about how blogs work, watch this brief video on the Common Craft Show: [Blogs in Plain English](http://www.commoncraft.com/blogs).  
**RSS Aggregators:** [bloglines.com](http://www.bloglines.com/) or [feedreader.com](http://www.feedreader.com/) or [reader.google.com](http://www.reader.google.com/)  
In order to stay abreast of any and all updates that your classmates make to their blogs, you will need to first create an account with an RSS aggregator. If you subscribe to all of your classmates’ blogs and any other relevant blogs related to the content covered in this course, your RSS aggregator will automatically update any time a post is made to a blog or Web site to which you subscribed.  
For more information about how RSS aggregators work, watch this brief video on the Common Craft Show: [RSS in Plain English](http://commoncraft.com/video-rss-plain-english).  
**Learner/Course Management Resources:**  
*Free, Web-Hosted Solutions*:  
Haiku: [haikuls.com](http://www.haikuls.com/); Rcampus: [rcampus.com](http://www.rcampus.com/); Edu 2.0: [edu20.org](http://www.edu20.org/)  
*Free Course Management Software:*  
Moodle: [moodle.org](http://www.moodle.org/)  
Moodle software is free and open source. However, finding a Web site to host your Moodle site is not free. If you have access to a Web site or Web hosting service through a company, university, or Internet service provider, Moodle is an excellent option to build your course. You can also purchase Web space through a variety of vendors for a relatively low fee, which will allow you to install Moodle and host your own site.  
**Wiki Sites:** [wikispaces.com](http://www.wikispaces.com/); [wetpaint.com](http://www.wetpaint.com/); [pbwiki.com](http://pbwiki.com/)  
For more information about how a wiki works, watch this brief video on the Common Craft Show: [Wikis in Plain English](http://commoncraft.com/video-wikis-plain-english).  
**Online Gradebooks:** [Engrade](http://www.engrade.com/); [MyGradeBook](http://www.mygradebook.com/); [SnapGrades](http://snapgrades.net/); [ThinkWave](http://www.thinkwave.com/); [TeacherEase](http://www.teacherease.com/); [TheGradeNetwork](http://www.gradenetwork.com/)  
Online gradebooks provide a Web-based application to store grades, list assignments, and provide many other features that help Instructors communicate with and manage their student population.  
**Share Space Sites:** [slideshare](http://www.slideshare.net/); [authorSTREAM](http://www.authorstream.com/)  
These Web sites allow users to upload audio files, presentations, Word documents**,** and spreadsheets, and store them for free. The files can be accessed by anyone with a computer and an Internet connection. Links are provided to embed files for downloading or presentations to be watched on your own Web site or blog. This feature is very helpful for educators who want to compile resources in one central location.  
**Video and Podcasting Resource Sites:**  
[youtube.com](http://www.youtube.com/); [video.yahoo.com](http://video.yahoo.com/); [video.google.com](http://video.google.com/); [teacherspodcast.org](http://www.teacherspodcast.org/)  
These free Web sites allow users to upload video and audio files, and store them for free, and can be accessed by anyone with a computer and an Internet connection. Links to embed the video in user Web sites is one of youtube.com's features that is very helpful for educators who want to provide immediate access to videos or podcasts that they create in their own Web sites.  
[gabcast](http://www.gabcast.com/); [Gcast](http://www.gcast.com/)  
These are quick and easy Web sites that allow you to make podcasts with your phone and upload them.  
For more information about how a podcast works, watch this brief video on the Common Craft Show: [Podcasting in Plain English](http://www.commoncraft.com/podcasting).  
**Video/Audio Editing Resources:**  
[Audacity](http://audacity.sourceforge.net/) – This free software can be downloaded and used for recording audio on your computer and editing the audio once you have recorded it.  
[AVSVideo](http://www.ghacks.net/2007/01/24/open-source-video-editing-with-jahshaka/); [Blender](http://www.blender.org/) – These Web sites offer open source video and audio editing applications.  
**Screencasting and Interactive Learning Object Resources:**  
[Jing®](http://www.jingproject.com/) – This is a free, intuitive application that allows you to record videos of your desktop up to five minutes long, as well as take screenshots, and instantly save them or upload them to screencast.com for easy sharing. It is an excellent tool that every educational technology professional can use for developing professional screecast demonstrations or to quickly share their desktop while they help a colleague use an application. The videos can be edited in Camtasia, which is not free, and it also has an upgrade you can purchase that allows you to record yourself on a camera during the demonstration.  
[Camtasia Studio 6](http://www.techsmith.com/camtasia.asp) – This software allows users to create films of desktop activity and record audio to create demonstrations. It also features extensive editing tools. The software requires the user to purchase a license, but the initial download and trial version is free.  
[CamStudio 2.5](http://camstudio.org/) – This software is a free, open-source suite that is very similar to the functions and features of Camtasia Studio. It allows users to capture desktop activity and record audio to make AVI video files that can be streamed or distributed.  
For a free, short tutorial on how to create a screencast using CamStudio, click on [Screencasting How To: CamStudio](http://video.google.com/videosearch?q=screencasting&hl=en&emb=0&aq=0&oq=screen+cas#q=screencasting%20how%20to&hl=en&emb=0).  
[Debut Video Capture Software](http://www.nchsoftware.com/capture/index.html) – An easy-to-use video recorder program that captures video files directly on a PC, Debut will record video from any of the following sources: webcam, capture device, or computer screen. This video recording software is provided for free by NCH Software, which offers a suite of other great, free tools for producing multimedia.  
[Adobe Captivate 4](http://www.adobe.com/products/captivate/) – This software allows users to create podcasts, screencasts, quizzes, and simulations utilizing the powerful and popular programming language ActionScript, available in Adobe Flash, without needing to know how to write in ActionScript code. A trial version can be downloaded for free, but in order to continue using the software, a license must be purchased.  
[Adobe Presenter 7](http://www.adobe.com/products/presenter/) – Rapidly create Adobe Flash presentations and eLearning courses from PowerPoint. Easily add narration, animations, interactivity, quizzes, and software simulations to eLearning courses. This software requires the purchase of a license.  
**archive.org**  
If you are having trouble locating a specific article or Web site because it seems to have been removed from the Internet, this Web site can be an easy solution to finding it. Copy the URL for the site that is missing, and paste it into the Wayback Machine on [www.archive.org](http://www.archive.org/). It should take you to the site for which you are searching. This helpful tool can help you track down information that is no longer posted on the Internet.

Top of Form



Bottom of Form