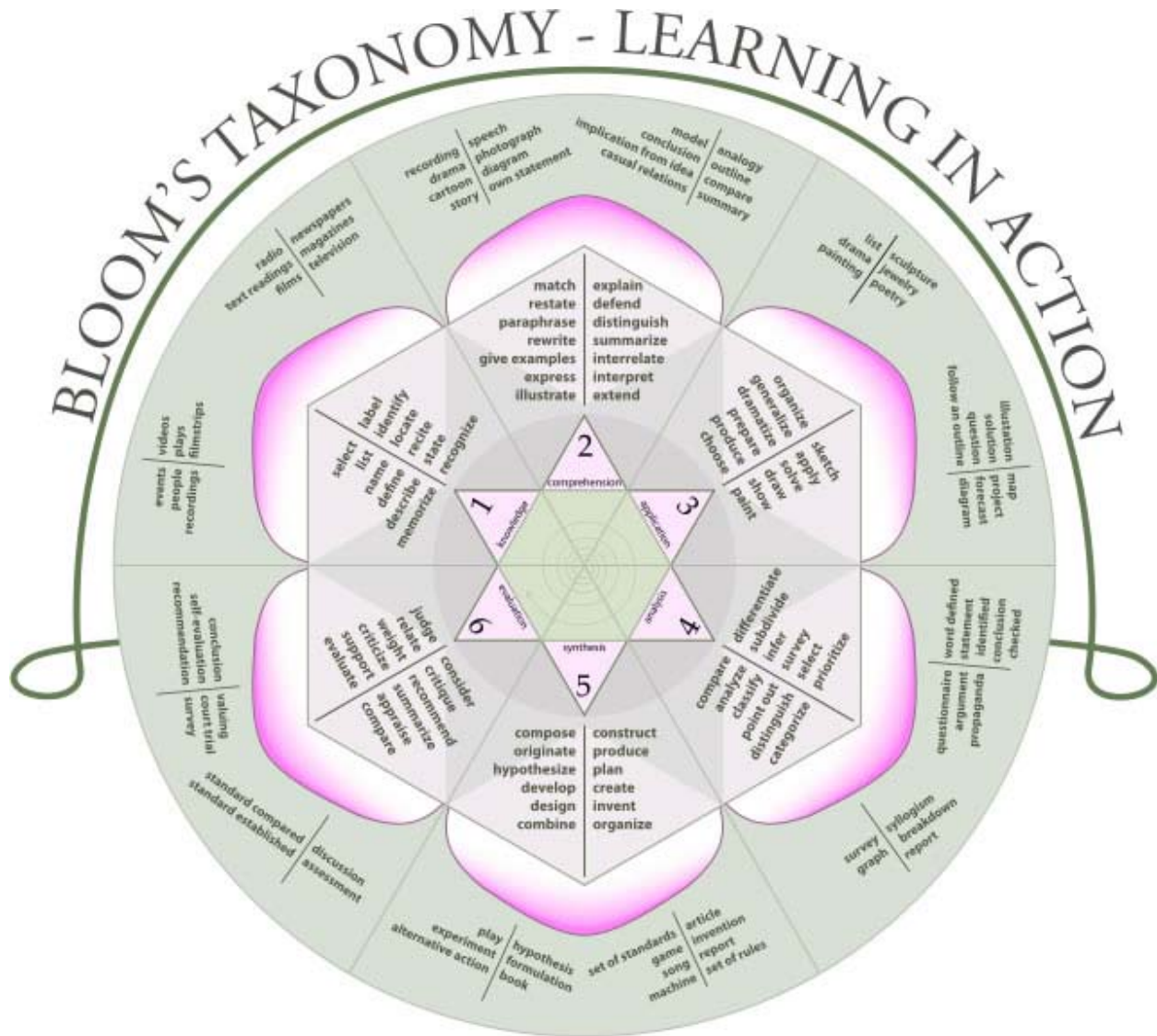# Modifying Bloom's Taxonomy to Meet 21st Century Pedagogies
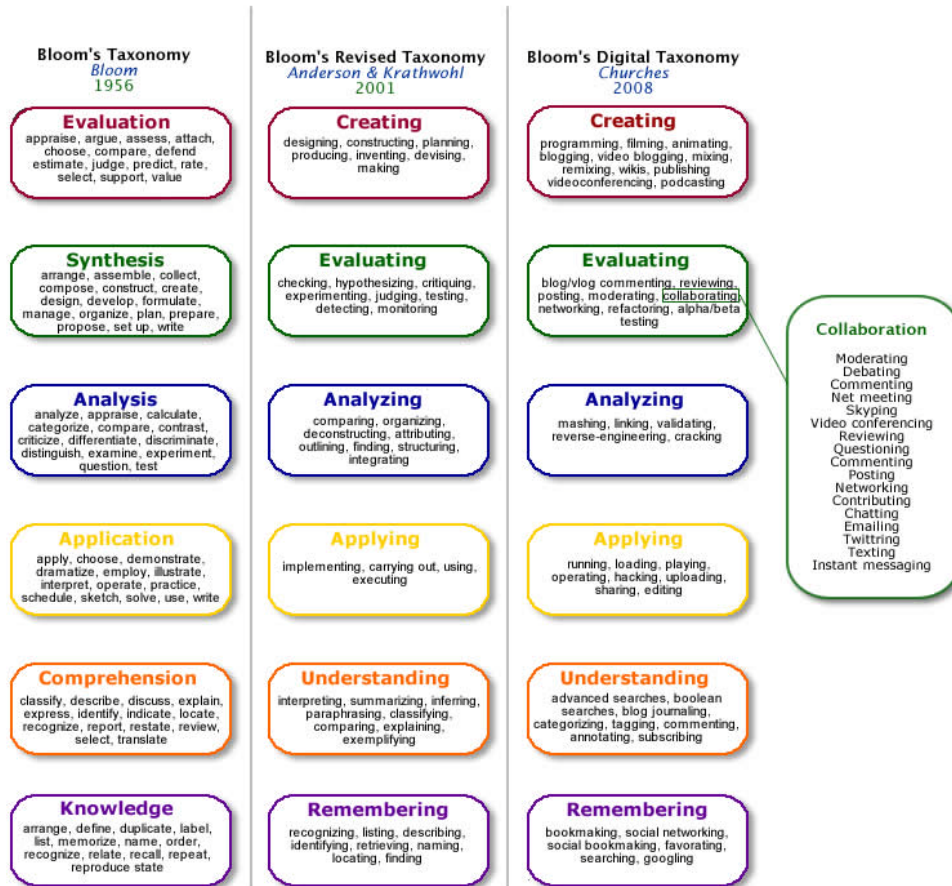
Authors: JoAnn Gonzalez-Major & Amanda Albright

Wikimedia Commons: image by K.Aainsqatsi – based on graphic created by John Manuel
GNU Free Documentation License

In 1956, Benjamin Bloom defined three domains of learning: Affective, Psychomotor, and Cognitive. The goal of the domains, termed Bloom's Taxonomy, was to create a more holistic approach to designing learning. Anderson & Krathwohl revised Bloom's original in 2001 to make it more relevant to newer educational theories by combining both the cognitive process and knowledge dimensions. Churches' Digital Taxonomy took the revision a step further in 2008 by adding multimedia technology to the taxonomy and the associated learning opportunities that emerge from the integration of web 2.0 technologies into the learning environment.

This resource was designed as a companion to the 2001 revised Bloom's Taxonomy and Churches' 2008 Digital Taxonomy.   Focusing on the Cognitive domain, this document provides a comparison of the three aforementioned versions of Bloom's Taxonomy as well as an extensive, though certainly not exhaustive, list of Web 2.0 resources that could be incorporated into educational settings to help meet the objectives set out in the course and for the students.

The following is a graphical representation of Bloom's Taxonomy overlaid with cognitive elements as well as methods required for web 2.0 technologies.

Note: Collaboration is included as a separate element because it is often addressed/discussed independent of the mechanisms used to collaborate. While collaboration is not an integral part of the learning process for the individual, you doing so often enhances learning. It is also important to note that collaboration is a skill of increasing importance in the business environment and gaining importance in the learning process.

Overview

Composed of six sections, one for each of the skills within the cognitive domain, each section starts with a domain summary for each of the three versions of the taxonomies. Each summary section is followed

by a set of tools and techniques that can be incorporated in both online environments and classroom settings to address the digital taxonomies.

While this document is presented in a linear fashion, the learning process can be initiated at any point; however, the lower taxonomic levels should be encompassed within the scaffolding of learning task.

Remembering (knowledge)			
	1956 Taxonomy	**2001 Taxonomy**	**2008 Taxonomy**
Defined	The remembering of previously learned material. This may involve the recall of a wide range of material, from specific facts to complete theories, but all that is required is the recall of appropriate information. Knowledge represents the lowest level of learning outcomes in the cognitive domain.		Recall or reorganization of specific information - element in growth of knowledge and information.
Skills Demonstrated	Observation and recall of information; knowledge of dates, events, places; knowledge of major ideas; mastery of subject matter		
Objective Examples	Know common terms, know specific facts, know methods and procedures, know basic concepts, know principles		Listing, describing, identifying, retrieving, locating, favorating, searching, googling
Possible Products	Quiz, definition, fact, worksheet, test, label, list, workbook, reproduction, diagrams		Web bookmark list, social networking site, mind map, web page, electronic flash cards, social bookmarking, search engine results page

Bullet pointing - This is analogous with listing but in a digital format.

Bookmarking or favorating – this is where the students mark for later use web sites, resources and files. Students can then organize these.

Highlighting – This is a key element of most productivity suites, encouraging students to pick out and highlight key words and phrases is a techniques for recall.

Searching or "googling" - Search engines are now key elements of students' research. At its simplest for (here) student are just entering a key word or phrase into the basic entry pane of the search engine.

Social networking – this is where people develop networks of friends and associates. It forges and creates links between different people. Like social bookmarks (see below) a social network can form a key element of collaborating and networking

Social bookmarking – this is an online version of local bookmarking or favorites, It is more advanced because you can draw on others bookmarks and tags. While higher order thinking skills like,

collaborating and sharing, can and do make use of these skills, this is its simplest form - a simple list of sites saved to an online format rather than locally to the machine.

Free Tools

- [AltaVista](#), [Ask](#), [Google](#), [Librarians' Internet Index](#), [Infomine](#), [Resources Discovery Network](#) and others for basic searches

- [Delicious](#), [Furl](#) for bookmarking, favorating, and social networking

- **Hot potatoes** -software that aids instructors and learners with the development of electronic crosswords, gap-fills, cloze tests, matching, multiple choice and jumbled exercises. http://hotpot.uvic.ca/

- Tools like [Facebook](#), [MySpace](#), [Digg,](#) and [Bebo](#) for social network opportunities.

- Mind mapping tools like [VUE](#) (Visual Understanding Environment), [MindMeister](#), [Mindomo](#), and [Bubbl](#) to develop lists, and complete labeling exercises and outlines.

Other Tools

- Cell phones and instant messaging tools for small action research projects
- Word processors to create bookmark lists
- Pdf viewers and word processors to highlight key materials in papers and articles
- **Inspiration** (free 30-day trial) http://www.inspiration.com/
- **Smart ideas** (free 30 day trial) http://www2.smarttech.com/st/en-US/Products/SMART+Ideas/

		Understanding (comprehension)	
	1956 Taxonomy	**2001 Taxonomy**	**2008 Taxonomy**
Defined	The ability to grasp the meaning of material. This may be shown by translating material from one form to another (i.e., words to numbers); by interpreting material (explaining or summarizing); and by estimating future trends (predicting consequences or effects).	Constructing meaning from oral, written, and graphics messages through interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining. Understand uses and implications of terms, facts, methods, procedures, concepts	
Skills Demonstrated	Understanding information, grasp meaning; translate knowledge into new context; interpret facts, compare, contrast; order, group, infer causes; predict consequences	Compare, demonstrate, differentiate, outline, group, fill in the blank questions	
Objective Examples	Understand facts and principles, interpret verbal material, interpret charts and graphs, translate verbal material to mathematical formulas, estimate the future consequences implied in data, justify methods and procedures	Make a list of the main events of a story, make a timeline of events, make a facts chart, write a list of information on a specific topic, use a set of symbols and graphics to draw a condition, method, or sequence	Create an interactive timeline, develop a concept map of the main ideas of a story, create & execute a search strategy of a libraries electronic holdings, research a given topic on the internet and assess the findings
Possible Products	Recitation, summary, collection, explanation, show and tell, example, quiz, list, label, outline		blog journal, categorized list of electronic resources, search strategy results, annotated list of links, wiki

Advanced and Boolean Searching - This is a progression from the Remembering domain. Students require a greater depth of understanding to be able to create, modify and refine searches to suit their search needs. This type of search requires an understanding of the keywords, Boolean logic, advanced search features, structuring and refining searches and suitable search engine.

Blog Journaling – One of the simplest uses for a blog is where a learner simply "talks" "writes" or "types" a daily or task specific journal. This type of assignment can show a basic understanding of content. Blogs can also develop higher level thinking skills when used for discussion and collaboration.

Categorizing & **Tagging** – digital classification - organizing and classify files, web sites and materials using folders, using Del.ico.us and other similar tools beyond simple bookmarking. This can be organizing,

structuring and attributing online data, meta-tagging web pages etc. The assumption is that students must be able understand the content of the pages to be able to tag and categorize it properly.

Subscribing – Subscription takes bookmarking in its various forms and simple reading one level further. The act of subscription by itself does not show or develop understanding but often the process of reading and revisiting the subscribe feeds leads to greater understanding.

Tagging, commenting and annotating – a variety of tools exist that allow learners to comment and annotate on web pages, pdf files and other documents. Learners will develop understanding by simply commenting on the pages. This type of activity is analogous with writing notes on hand outs, but is potentially more powerful as they can link and index these.

Free Tools

- **Audacity** for recording and editing explanations for show-and-tell type activities
  http://audacity.sourceforge.net/

- **Blogger** – Google resource that allow the user to set up an unlimited number of hosted blogs for free. The resources is easy to use and has a built in tutorials. http://www.blogger.com

- **Bluepulse** – mobile social networking tool that works on most internet-enabled phones.
  http://www.bluepulse.com/index.php

- **Bebo** – product allows users to share photos with music, and blogs, and draw on members' White Boards. http://www.bebo.com

- **Bloglines** - A web-based personal news aggregator that allows learners to subscribe to blogs, email groups, and websites then publish the resources that they collect on their own blogs.
  http://www.bloglines.com/

- **Classroom blogmiester** – free blogging tool developed specifically for classroom use.
  http://classblogmeister.com/

- **Collectives** – provides private and public group sites for sharing and staying connected. (If you want custom branding and permission controls on the site it will cost $9.00 per month.)
  http://www.collectivex.com/

- **Delicious** – social bookmarking manager that learners can use to search for blog and website postings associated with a given topic(s) and then share the resources with others.
  http://delicious.com/

- **Edublogs** – free blog hosting service based on Wordpress. Site is dedicated to offering blogs for faculty and students. Site contains a number of teaching techniques for integrating blogs into the learning environment, and they offer classroom and campus wide solutions.
  http://edublogs.org/

- **Facebook** - online social networking tool. http://www.facebook.com/

- **Google Groups** – learners can join active groups, or set up free public or private groups where they can chat, exchange emails and share resources. http://groups.google.com/

- **Google Reader** – another web-bases personal news aggregator. http://www.google.com/reader

- **Miaplaza** – site allows for private communities and allows text, photos, and videos to be shared through discussion forums, chats, and email. http://www.miaplaza.com/Login.aspx

- **MySpace** - An international site that offers email, a forum, communities, videos and weblog space. Http://www.myspace.com

- **Ning** – users with no programming experience can create custom social websites. http://www.ning.com/

- **Wordpress** – the software for this blog tool can be downloaded for free and hosted on your own server or hosting service at http://wordpress.org/, or you can free hosted blog at WordPress.com http://wordpress.com/

- **Yahoo Groups** – learners can join existing groups, create new groups, share resources, set up group calendars and chat. http://groups.yahoo.com/

- **Zotero** - a free, easy-to-use Firefox extension to help users collect, manage, and cite research sources. http://www.zotero.org/

- Mind mapping tools like VUE (Visual Understanding Environment), MindMeister, Mindomo, and Bubbl to develop lists, and complete labeling exercises and outlines.

- Using tools like MemoryLifter, Virtual Flashcards, StudyMe (generates flashcards that can be used on cell phones), and Quiz Buddy to aide in memorization, test preparation and peer-to-peer support activities.

- Blog tools like blogger, Wordpress, Edublogs, and Classroom Blogmeister for journaling and simple page construction.

- Wiki tools like PBWiki, WetPaint, Wikispaces for simple page construction, housing resource collections, collaborative documents, and show-and-tell type activities.

Other Tools
- Word Processor to develop recitations, summary documents, and outlines.

- Respondus StudyMate Class server – where instructors and learners can post and share study materials in a web-based collaborative environment.

- Respondus StudyMate Author to create memory games and flashcards using simple templates.

- Presentation tools for recitation

- Digital recorders for explanations and show-and-tell type activities

Applying (application)			
	1956 Taxonomy	**2001 Taxonomy**	**2008 Taxonomy**
Defined	The ability to use learned material in new and concrete situations. This may include the application to such things as rules, methods, concepts, principles, laws, and theories. Learning outcomes in this area require a higher level of understanding that those under comprehension.	Carrying out or using a procedure through executing or implementing. Applying relates and refers to situations where learned material is used through products like models, presentations, interviews and simulations.	
Skills Demonstrated	Use information; use methods, concepts, theories in new situations, solve problems using required skills or knowledge		
Objective Examples	Apply concepts and principles to new situations, apply laws and theories to practical situations, solve mathematical problems, construct graphs and charts, demonstrate the correct usage of a method or procedure.	Illustrate what you think the main idea may have been, Make a cartoon strip showing the sequence of events, write a performance play based on the story, write a summary report of the events, prepare a flow chart to illustrate the sequence of events	
Possible Products	Paper, graphs, charts, demonstrations, presentations, performance	Illustration, simulation, sculpture, demonstration, presentation, interview, performance, diary, journal	Multimedia presentations, games & educational units, community groups, podcasts, vodcasts, blogs, wikis, computer generated designs

Collaborating using electronic tools for sharing, editing and uploading materials. The tools would include products like Elluminate, Adobe Connect, Wimba, and similar products . Assessment of collaboration activities would be based on the learners ability to use appropriately the tool to facilitate the discussion.

Editing – With most media's, editing is a process or a procedure that the editor Employs Illustration.

Hacking – hacking in its simpler forms is applying a simple set of rules to achieve a goal or objective.

Playing – The increasing emergence of games as a mode of education leads to the inclusion of this term in the list. Students who successfully play or operate a game are showing understanding of process and task and application of skills.

Running and operating - the action of initiating a program. This is operating and manipulating hardware and applications to obtain a basic goal or objective.

Uploading and Sharing - uploading materials to websites and the sharing of materials via sites like [flickr](#), [Yahoo Groups](#), [Google Groups](#), etc. This is a simple form of collaboration, a higher order thinking skill. Tools like: word processors, [mind mapper](#), podcast, vodcast, [Audacity](#), digital recorder, and [Skype](#) can be used for interviews then uploaded to a project site.

Free Tools

- **Alice 2.0** - free scripting and prototyping environment program for 3D object behavior. (Windows only) http://www.alice.org/index.php?page=downloads/download_alice

- **Crocodile Clips** – constructivist based simulation packages that can be download and integrated into curriculum. Many of their products can be downloaded for free for assessment purposes by [registering your school](#), if integrated into lesson plans a site license will have to be purchased. http://www.crocodile-clips.com/

- **GIMP** – a free image manipulation program that provides tools for photo retouching, image composition, and image authoring. http://www.gimp.org/

- **GoAnimate –** online animation tool that allows users to create comic based movies that they can share with social networks, and embed into blog, wikis, and web pages. http://goanimate.com

- **Google Docs** - tools allows for the creation and sharing of online documents, presentations, and spreadsheets   http://docs.google.com/

- **Google Sketchup** – software that can be used to create, modify, and share 3D models. http://sketchup.google.com/

- **Inkscape** – "An Open Source vector graphics editor, with capabilities similar to Illustrator, CorelDraw, or Xara X." http://www.inkscape.org/

- **JING** – package allows user to capture images, record audio, and capture content that can be uploaded and shared through email, blogs, or IM. http://www.jingproject.com

- **Star Office** - With slide templates, custom fonts, combined audio, video, animations, and special effects users can create multimedia presentations (http://pack.google.com [pc only])

- **Mmorpg** – online multiplayer strategy games. http://mmorpg.com/index.cfm?bhcp=1

- **Platform Studio** – easy to use studio that assists users in designing 2D platform games. Software must be download to a local computer. http://soft.firstproductions.com/pstudio/index.html

- **Scratch –** programming language created by MIT that makes it easy to create interactive stories, animations, games, music and art. http://scratch.mit.edu/

- **Tuxpaint** - free children's drawing program. Runs on Mac, Windows, and Linux platforms. http://www.tuxpaint.org/

- **Zoho Show –** product allows learners to develop, collaborate, and share presentations online. "Zoho Show's pre-built themes, clipart and shapes coupled with features like drag-and-drop makes it an easy application to use. " Learners can then take the presentations that they develop and imbed the products into blogs or web pages. http://show.zoho.com/jsp/zoho_login.jsp?serviceurl=%2FHome.do

- **3D Adventure Studio** - an editor for creating adventure games in style of Gabriel Knight 3 (Windows only) http://3das.noeska.com/

Other Tools

- **Comic creation tools** – Features include Page and Panel layouts, (including styles for a real comic-strip look), streamlined image selection, cropping and placement, authentic speech balloons (enhanced by a built-in professional quality comic lettering font), captions and special **effects text** – (free 30 day trial) http://plasq.com/comiclife/

- **Learning by Simulations –** this site is a repository for math, physics, computer science, and chemistry simulations. http://www.vias.org/simulations/

- **Real Lives** –collection of educational simulations dedicated to enhancing the users understanding and compassion in a global society. http://www.educationalsimulations.com/

- **Play2Train –** "a virtual training space in SecondLife designed to support Strategic National Stockpile (SNS), Simple Triage Rapid Transportation (START), Risk Communication and Incident Command System (ICS) Training." http://irhbt.typepad.com/play2train/

- **Snag-It** – easy to use screen capture and editing tool (~ $50 per copy - 30 day trial version can be downloaded for free). http://www.techsmith.com/screen-capture.asp
- Presentation Packages

- Digital recorder

- Video and sound tools

- Presentation tools to develop Jeopardy and Who Want to be a Millionaire type games

Analyzing (analysis)			
	1956 Taxonomy	**2001 Taxonomy**	**2008 Taxonomy**
Defined	The ability to break down material into its component parts so that its organizational structure may be understood. This may include the identification of parts, analysis of the relationships between parts, and recognition of the organizational principle involved. Learning outcomes here represent a higher intellectual level than comprehension and application because they require an understanding of both the content and the structural form of the material.	Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose through differentiating, organizing, and attributing. Take concepts apart, break them down, analyze structure, recognize assumptions and poor logic, evaluate relevancy	
Skills Demonstrated	Seeing patterns, organization of parts, recognition of hidden meanings, identification of components		
Objective Examples	Recognize unstated assumptions, recognizes logical fallacies in reasoning, distinguish between facts and inferences, evaluate the relevancy of data, analyze the organizational structure of a work (art, music, writing)	Distinguish relevant from irrelevant parts or important from unimportant parts of presented material; determine how elements fit or function within a structure; determine the point of view, bias, values, or intent underlying presented material	Learners will break information into parts/ components to explore, develop, construct and understand relationships.
Possible Products	Survey, abstract, report, graph, checklist, chart	Survey, database, mobile, abstract, report, graph, spreadsheet, checklist, chart, outline	Mashups, chart of electronic resources, mind/concept maps, software/hardware analysis, sharable web-based spreadsheet, interactive charts, online surveys, theme based social network

Cracking – cracking requires the cracker to understand and operate the application or system being cracked, analyze its strengths and weaknesses and then exploit the findings.

Linking – this is establishing and building links within and outside of documents and web pages.

Mashing - mashups are the integration of several data sources into a single resource. Mashing data currently is a complex process but as more options and sites evolve this will become an increasingly easy and accessible means of analysis. An example of a mashing is the use of cartographic data from Google Maps to add location information to real-estate data, thereby creating a new and distinct web service that was not originally provided by either source.

Reverse-engineering - this is analogous with deconstruction. It is also related to cracking often without the negative implications associated with technique. One way to design this activity is to require learners to develop relationship mind maps: herring or fish bone mind maps, SWOT Analysis, PMI, Venn, or 6 questions.

Free Tools

- **Ballot box** – Ballot Box allows you to create a free online poll for your website. Before you can get started, you'll need to create an account. Then you can create 15 questions for your poll and each question can have 15 answers. Poll appearance are completely customizable with real-time updates and poll results. Poll results can be made private or public and also prevents users from voting twice. You can also create up to 25 polls. If you are conducting a survey, you might want to consider creating a poll with multiple questions. http://www.ballot-box.net/

- **Blogflux** - Blog Flux requires that users create an account on their site before they can create a poll. Once the account is created, they can then create the poll with up to five options. A unique feature is that the voting results are mapped on Google maps. The site has other tools to enhance your blog such as a button or chicklet creator, a link logger, and a page rank checker. http://www.blogflux.com/

- **Cmap** - tool that assists learners in constructing, navigating, sharing, and criticizing concept maps. http://cmap.ihmc.us/

- **FreeMind –** a free mind mapping application written in Java. FreeMind is licensed under the GNU General Public License. It provides extensive export capabilities. http://freemind.sourceforge.net/wiki/index.php/Main_Page

- **Gliffy** - lets you create charts and diagrams online, using a library of pre-drawn symbols, and save them as images to embed in documents and web pages. Both the free Basic and premium ($5/month)versions allow users to collaborate in near real time, and Gliffy automatically keeps a copy every time a document is saved, so you can track changes or revert to an earlier version. http://www.gliffy.com/

- **MindMeister** is a web-based mind mapping software that allows an unlimited number of users to collaborate in real time. Import your mind maps from **Freemind** and **MindManager**, publish mind maps to your website or blog, or export them as images, PDF or RTF files. Full premium features ($4/month) are free for all account holders for the first 30 days. http://www.mindmeister.com/

- **Mindomo's** free version is very comparable to that of **MindMeister**, with the addition of a useful option to keep your mind map private or share it with selected colleagues. The premium version ($6/month) includes a spell check utility, folders, full-screen view, and the ability to export mind maps in MindManager, Microsoft Project and Microsoft Excel formats.

- **Polldady** – users can create polls and surveys for websites, blogs and social networking profiles. http://www.polldaddy.com/

- **Survey monkey** – SurveyMonkey is a web-based service that allows you to create online surveys. It is quite intuitive and easy to use. You can either create from scratch or use templates. Participants can go to the site to respond, or you can create a link from your site. You can add logos and banners, change colors and customize in many different ways. Basic subscribers are limited to a total of 10 questions and 100 responses per survey. The basic subscription is free. If you want to go beyond 100 respondents, and up to 1000 and gain access to many more features, there is a cost. http://www.surveymonkey.com/Default.aspx

- **Surveygizmo** - Survey Gizmo has an easy-to-use interface. It requires that you create an account on their site before you have access to the tools to create a survey. Once your account is created, you can set up an online survey with over 12 different styles of questions. You can also generate multiple reports when all of your data is inputted. Finally, the connect-to-website feature is just great, allowing you the copy HTML into your site or just provide a link. I also like that it is free for up to 250 responses per month. After that the pricing goes up to $14/month for 1,000 responses. http://www.surveygizmo.com/

- **Vizu** - Polls generated by Vizu.com are delivered via a Flash widget rather than a snippet of JavaScript or HTML code. Vizu walks you through the steps of creating a poll and gives you total control of the look and feel. http://www.vizu.com/

- **VUE -** a free, open source concept mapping application written in Java. The application is developed by the Academic Technology group at Tufts University. VUE is licensed under the Educational Community License. http://vue.tufts.edu/

Other Tools
- **Inspiration** – can be used to develop and support persuasive speeches (free 30-day trial) http://www.inspiration.com/

- **Smart ideas** (free 30 day trial) http://www2.smarttech.com/st/en-US/Products/SMART+Ideas/

- Social networking tools
- Word Processor
- Spreadsheets
- Email and discussion boards
- Clickers
- MySQL and/or Access for the development of relational databases
- Presentation software
- Web pages
- Blog entries
- Wiki pages

Evaluating (synthesis)			
	1956 Taxonomy	**2001 Taxonomy**	**2008 Taxonomy**
Defined	The ability to put parts together to form a whole. This may involve the production of a unique communication (theme or speech), a plan of operations (research proposal), or a set of abstract relations (scheme for classifying information), Learning outcomes in this area stress creative behaviors, with major emphasis on the formulation of ne patterns or structures.	Making judgments based on criteria and standards through checking and critiquing. Set standards, judge using standards, evidence, rubrics, accept or reject on basis of criteria.	
Skills Demonstrated	Use old ideas to create new ones, generalize from given facts, relate knowledge from several areas, predict/draw conclusions	Argue, critique, defend, interpret, judge, measure, select, test, verify	
Objective Examples	Write a well organized theme, gives a well organized speech, writes a creative short story, proposes a plan for an experiment, integrates learning from different areas in to a plan for solving a problem, formulates a new scheme for classifying objects (or events, or ideas)	Detect inconsistencies or fallacies within a process or product; detect the appropriateness of a procedure for a given task or problem; conduct a debate about an issue of special interest; prepare a case to present your view about… Justify a decision, solution, answer or course of action by developing/constructing and applying standards and criteria.	
Possible Products	Paper, speech, short story, project plan	Debate, discussion panel, report, evaluation, investigation, verdict, conclusion, persuasive speech, self-evaluation	Blog, vlog, wiki, twitter, audio/video conference, new application, film, podcast

Blog/vlog commenting and reflecting - Constructive criticism and reflective practice is often facilitated by the use of blogs and video blogs (vlog).

Moderating – This is high level evaluation, the moderator must be able to evaluate a posting or comment from a variety of perspectives, assessing its worth, value and appropriateness. Tools that can be used for commenting on, and moderating postings are: discussion boards, forums, blog, wiki's, twitter, threaded discussions, bulletin boards, chat rooms.

Podcasting – podcasting is a creative process involving several different components. A successful podcast must be planned and scripted. It requires care and preparation to record and construct, and requires learners to plan clear and concise messages using a one way communication mechanism.

Posting – posting comments to blogs, discussion boards, threaded discussions. These are increasingly common elements of students' daily practice. Good postings like good comments are not simple one line answers rather they structured and constructed to evaluate the topic or concept.

Testing (Alpha and Beta) – Testing of applications, processes and procedures is a key element in the development of any tool. To be effective testers students must have the ability of analyze the purpose of the tool or process, what its correct function should be and what its current function is.

Validating – With the wealth of information available to students combined with the lack of authentication of data, students of today and tomorrow must be able to validate the verity of their information sources. To do this they must be able to analyze and evaluate the data sources and make judgments based on these. Key elements of validating the information is reporting the information source, accessing multiple information sources and information types, creating linkages between the information sources and making decisions on the validity of information based on this process.

Wikis – Allows learners to show understanding by developing content via paraphrasing and authoring material on a related topic in a wiki environment. The authoring aspect of this type of tool shows application as the learner edits the wiki to a suitable standard. Click here to learn more about using wikis in teaching.

Collaborating and networking – Collaboration is an increasing feature of education. In a world increasingly focused on communication, collaboration, leading to collective intelligence is a key aspect. Effective collaboration involves evaluating the strengths and abilities of the participants and evaluating the contribution they make. Networking is a feature of collaboration, contacting and communicating with relevant person via a network of associates. Some of the techniques that can be utilized to illicit collaborative networking are: panel discussions, group projects, and social networking.

Free Tool
- **Arcview** – "a desktop GIS mapping software that provides geographic data visualization, mapping, management, and analysis capabilities along with the ability to create and edit data." http://www.rockware.com/downloads/index.php?id=freesoftware

- **Blogger** – Google resource that allow the user to set up an unlimited number of hosted blogs for free. The resources is easy to use and has a built in tutorials. http://www.blogger.com

- **Bluepulse** – mobile social networking tool that works on most internet-enabled phones. http://www.bluepulse.com/index.php

- **Bubbl.us** is a simple, Flash-based brainstorming tool that produces mind maps you can embed in a web page. I found it most useful in making a quick diagram to show hierarchical relationships in a graphical format — as in an organizational chart or a family tree. http://www.bubbl.us/

- **Classroom blogmiester** – free blogging tool developed specifically for classroom use. http://classblogmeister.com/

- **Click Caster** – easy to use web based publishing platform. http://www.clickcaster.com/

- **Collectives** – provides private and public group sites for sharing and staying connected. (If you want custom branding and permission controls on the site it will cost $9.00 per month.) http://www.collectivex.com/

- **Edublogs** – free blog hosting service based on Wordpress. Site is dedicated to offering blogs for faculty and students. Site contains a number of teaching techniques for integrating blogs into the learning environment, and they offer classroom and campus wide solutions. http://edublogs.org/

- **Flickr** – online photo and video sharing tool that allows users to share collections, create location maps, photo books, cards and calendars . http://www.flickr.com/

- **FreeMind –** a free mind mapping application written in Java. FreeMind is licensed under the GNU General Public License. It provides extensive export capabilities. http://freemind.sourceforge.net/wiki/index.php/Main_Page

- **Gcast** – create and download podcasts . http://www.gcast.com/?nr=1&&s=73188660

- **Gliffy** - lets you create charts and diagrams online, using a library of pre-drawn symbols, and save them as images to embed in documents and web pages. Both the free Basic and premium ($5/month)versions allow users to collaborate in near real time, and Gliffy automatically keeps a copy every time a document is saved, so you can track changes or revert to an earlier version. http://www.gliffy.com/

- **Google Earth** – Learners can "view satellite imagery, maps, terrain, 3D buildings and even explore galaxies in the Sky. You can explore rich geographical content, save your toured places and share with others." http://earth.google.com/

- **Google Groups** – learners can join active groups, or set up free public or private groups where they can chat, exchange emails and share resources. http://groups.google.com/

- **Miaplaza** – site allows for private communities and allows text, photos, and videos to be shared through discussion forums, chats, and email. http://www.miaplaza.com/Login.aspx

- **MindMeister** is a web-based mind mapping software that allows an unlimited number of users to collaborate in real time. Import your mind maps from **Freemind** and **MindManager**, publish mind maps to your website or blog, or export them as images, PDF or RTF files. Full premium features ($4/month) are free for all account holders for the first 30 days. http://www.mindmeister.com/

- **Mindomo's** free version is very comparable to that of **MindMeister**, with the addition of a useful option to keep your mind map private or share it with selected colleagues. The premium version ($6/month) includes a spell check utility, folders, full-screen view, and the ability to export mind maps in MindManager, Microsoft Project and Microsoft Excel formats.

- **Ning** – users with no programming experience can create custom social websites. http://www.ning.com/

- **Odeo Studio** – create audio with the online recorder or import digital audio to create podcasts. http://studio.odeo.com/create/home

- **PBWiki** - ad Free hosted wiki tool for educators. http://pbwiki.com/education.wiki

- **podOmatic** – create, find and share podcasts from this site http://www.podomatic.com/

- **Skype** – can be used for group video and phone conferencing and online office hours. http://www.skype.com/

- **Twitter** – resource provides a tool for quick exchanges between users. http://twitter.com/

- **VUE -** a free, open source concept mapping application written in Java. The application is developed by the Academic Technology group at Tufts University. VUE is licensed under the Educational Community License. http://vue.tufts.edu/

- **Wetpaint** - wiki website that is easy to use and designed for collaboration - can add youTube videos, polls, and more. http://www.wetpaint.com/

- **Wikispaces** - simple wiki tool that is very easy to setup and manage. http://www.wikispaces.com/

- **Window Live Messenger** – can be downloaded and used for can synchronous debates across distances. http://get.live.com/messenger/overview

- **Wordpress** – the software for this bolg tool can be downloaded for free and hosted on your own server or hosting service at http://wordpress.org/, or you can free hosted blog at WordPress.com http://wordpress.com/

- **Yahoo Groups** – learners can join existing groups, create new groups, share resources, set up group calendars and chat. http://groups.yahoo.com/

- **Yahoo Instant Messenger** - can be downloaded and used for can synchronous debates across distances. http://messenger.yahoo.com/

- Three other web-based mind mapping applications you might want to try are the surprisingly powerful **WiseMapping** (http://www.wisemapping.com/c/home.htm), the new **Mind42** (http://www.mind42.com/ - just out of beta testing, which currently places no limitations on numbers of users or saved mind maps) and **Thinkature** (http://thinkature.com/) , which combines collaborative mind mapping with voice chat.

Other Tools
- **Elgg** – software allows of the creation on social networks – product is based on an open source platform and must be hosted on your site. http://elgg.net/

- **Inspiration** – can be used to develop and support persuasive speeches (free 30-day trial) http://www.inspiration.com/

- **Smart ideas** (free 30 day trial) http://www2.smarttech.com/st/en-US/Products/SMART+Ideas/

- live classrooms - Elluminate, Adobe Connect, Wimba, etc

- Digital cameras to record presentations, plays, peer facilitation activities.

- Word processors t develop scripts

- Digital recorders to present speeches for review and critique

- Wiki features built into learning/course management systems

- web page
- Podcasting features built into learning/course management systems
- Digital audio recorder
- Video and phone conferencing

Creating (Evaluation)			
	1956 Taxonomy	**2001 Taxonomy**	**2008 Taxonomy**
Defined	Evaluation is concerned with the ability to judge the value of material (statement, novel, poem, and article) for a given purpose. The judgments are to be based on definite criteria. These may be internal criteria (organization) or external criteria (relevance to the purpose) and the student may determine the criteria or be given to them.	Creating is concerned with putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing. Learners will put things together; bring together various parts; plan experiments, put information together in new and creative ways.	
Skills Demonstrated	Compare and discriminate between ideas; assess value of theories, presentations; make choices based on reasoned argument; verify value of evidence	Synthesize, arrange, blend, create, deduce, devise, organize, plan, present	
Objective Examples	Judge the logical consistency of written material, judge the adequacy with which conclusions are supported by data, judge the value of a work (art, music, writing) by the use of internal criteria, judge the value of a work by use of external standards of excellence.	Develop alternatives or hypotheses based on selected criteria; devise a procedure of accomplishing a selected task; design a tool to perform a specific task; create a product, give it a name and plan a marketing campaign within selected parameters; write a TV show, play, puppet show, role play, song or pantomime about…	
Possible Products	Paper, story, project, plan, song, painting	Film, story, project, plan, new game, song, media product, advertisement, painting, radio show, video, new product development	Multimedia applications, macros, electronic games, films, videocasting, podcasting, directing/producing products, digital storytelling, wikis, blogs, model design, electronic painting & drawing

Digital Tools

Directing and producing – to directing or producing a product, performance or production is a highly creative process. It requires the student to have vision, understand the components and meld these into a coherent product.

Filming, animating, videocasting, podcasting, mixing and remixing – these relate to the increasing trend to using and availability of multimedia and multimedia editing tools. Students frequently capture, create, mix and remix content to produce unique products.

Podcasting or vodcasting can also be used for guided asynchronous debates, and **iCam** and web meeting tool for debates across distances. Mind mapping tools can be used to define arguments and possible rebuttals. Chatrooms and Instant Messaging (IM) services can be enable synchronous debates across distances. Discussion Boards and email can be used for guided asynchronous debates. Persuasive speeches can be presented across distances with mind map tools used in presentation mode (samples of argument maps can be found at http://www.nu.ac.za/undphil/reason.htm#demarcat).

Programming - Whether it is creating their own applications, programming macros or developing games or multimedia applications within structured environments, learners are routinely creating their own programs to suit their needs and goals. Why not harness that creativity and have learners design a functional project that addressed course objectives and outcomes.

Publishing – whether via the web or from home computers, publishing in text, media or digital formats are increasing. Again this requires a huge overview of not only the content being published, but the process and product. Related to this concept are also **Video blogging** – the production of video blogs, **blogging** and also **wiking** - creating, adding to and modify content in wikis. Creating or **building Mash ups** and **Digital Storytelling** would also fit in this domain.

Free Tools

- **AjaxWrite** - Web based word processing program. http://www.ajaxwrite.com/

- **Alice 2.0** - free scripting and prototyping environment program for 3D object behavior. Runs on Windows (http://www.alice.org/index.php?page=downloads/download_alice)

- **Animoto** - web application that automatically generates professionally produced videos using their own technology and motion design. Each video is a fully customized orchestration of user-selected images and music. Produced on a widescreen format (www.animoto.com)

- **Audacity** - for podcasting, recording narration in presentations (http://audacity.sourceforge.net/)

- **Blender** - an open source, cross platform suite of tools for 3D creation. http://www.blender.org/

- **Blogger** – Google resource that allow the user to set up an unlimited number of hosted blogs for free. The resources is easy to use and has a built in tutorials. http://www.blogger.com

- **C-Map** (open source) http://cmap.ihmc.us/

- **Classroom blogmiester** – free blogging tool developed specifically for classroom use. http://classblogmeister.com/

- **Click Caster** – web based podcast publishing tool. http://clickcaster.com/

- **Dvolver** –online movie making tool. Movies that learners create can be saved on their server or sent to others. *www.dvolver.com*

- **Gamemaker** – written to make it easier for people to design and make their own computer games. (http://www.mindtools.tased.edu.au/gamemaker/default.htm)

- **Edublogs** – free blog hosting service based on Wordpress. Site is dedicated to offering blogs for faculty and students. Site contains a number of teaching techniques for integrating blogs into the learning environment, and they offer classroom and campus wide solutions. http://edublogs.org/

- **Finale notepad** – free music notation software (http://www.finalemusic.com/notepad/)

- **Freemind** (open source) http://freemind.sourceforge.net/wiki/index.php/Download

- **Ganttproject** for Gantt charts and PERT Charts (http://ganttproject.biz/)

- **Gcast** – web based site that allows the user to record and mix podcasts http://www.gcast.com/?nr=1&&s=39730413

- **GIMP** – a free image manipulation program that provides tools for photo retouching, image composition, and image authoring. http://www.gimp.org/

- **Historic tale construction kit** –flash based application that allows learners to create a comic book type story using medieval backdrops and images. Once created the projects can be emailed or added to an online gallery. http://www.adgame-wonderland.de/type/bayeux.php

- **Jump cut** – provides a way to upload, edit, and share videos and photos for free (www.jumpcut.com)   Eyespot - Eyespot provides video editing and sharing software that can be easily embedded in any website (www.eyespot.com)

- **Maya3d PLE** – personal learning edition based on the Autodesk Maya 8.5 software. This version is restricted to non-commercial applications. http://usa.autodesk.com/adsk/servlet/index?siteID=123112&id=7639525

- **Microsoft Movie Maker** – Microsoft PC product that comes with XP service pack 2. If you need to download another copy go to http://www.microsoft.com/windowsxp/downloads/updates/moviemaker2.mspx

- **Microsoft NetMeeting** for XP, or Windows Meeting Space for Vista users. Both products are built into their respective versions of Windows.

- **ODEOStudio** – web based site that allows the user to record audio or import audio for podcast mixing and distribution. http://studio.odeo.com/create/home

- **Open Office** – free and open office productivity tools (http://www.openoffice.org/)

- **Openproj** for Gantt, Pert and critical pathways – the product is a desktop replacement for Microsoft Project; it has equivalent functionality, a similar user interface and even opens existing MSProject files. (http://sourceforge.net/projects/openproj/)

- **Photostory** by Microsoft – easy to use free software download from Microsoft. Works on PCs only. http://www.microsoft.com/windowsxp/using/digitalphotography/photostory/default.mspx

- **Picnik** - free server based photo editing program. http://www.picnik.com

- **Pinnacle** – video community site dedicated to editing. They operate a free space on the web where students can share their videos   (www.pinnacleshare.com)

- **podOmatic** – site that allows for the creation and sharing of podcasts. http://www.podomatic.com/

- **RPG Maker XP** – description (http://tkool.jp/products/rpgxp/eng/)

- **Scratch –** programming language created by MIT that makes it easy to create interactive stories, animations, games, music and art. http://scratch.mit.edu/

- **Sketchup** – Google 3D software tool, software, training, and tutorials are avaliable on the site. The base product is free, pro version can be downloaded for a trial period. http://sketchup.google.com/

- **Skype** – product provides free video calls and instant messaging. The PC & Mac software, and product user documentation can be found at http://www.skype.com/

- **Star Office** - With slide templates, custom fonts, combined audio, video, animations, and special effects users can create multimedia presentations (http://pack.google.com [pc only])

- **Tuxpaint** - free children's drawing program. Runs on Mac, Windows, and Linux platforms. http://www.tuxpaint.org/

- **Wordpress** – the software for this blog tool can be downloaded for free and hosted on your own server or hosting service at http://wordpress.org/, or you can free hosted blog at WordPress.com http://wordpress.com/

- **Yahoo Instant Messenger** – product runs on Mac & PC, and can be downloaded at http://messenger.yahoo.com/

- **Zoho** Work presentation tool (http://zoho.com/)

Other Tools
- **Adobe Premier elements** - Users can create flash videos that can be shared online or through mobile devices (http://www.adobe.com/products/premiereel/)

- **Apple iLife 08** – For MACs only. Comes packaged with newer MACs. Can be purchased separately. http://www.apple.com/ilife/

- **Comic creation tools** – Features include Page and Panel layouts, (including styles for a real comic-strip look), streamlined image selection, cropping and placement, authentic speech balloons (enhanced by a built-in professional quality comic lettering font), captions and special effects text – (free 30 day trial) (http://www.apple.com/downloads/macosx/imaging_3d/comiclife.html)

- **Flash** – Adobe product – high learning curve and a bit expensive.

- **GIMP**- is a GNU Image Manipulation Program. It is a freely distributed piece of software for such tasks as photo retouching, image composition and image authoring. It works on many operating systems, in many languages. (http://www.gimp.org/)

- **Inspiration** (free 30-day trial) http://www.inspiration.com/

- **Paint.net** – free photo editing software. (http://www.getpaint.net)

- **Pinnacle Studio** - video capture and transfer software. (http://www.pinnaclesys.com/PublicSite/us/Home/)

- **Quicktime Pro** -Apple product that runs on the PC and MAC (~$30.00)
  http://www.apple.com/quicktime/pro/

- **RealPlayer Plus** – product runs on PC and MAC (`$40.00). http://www.real.com/

- **Smart ideas** (free 30 day trial) http://www2.smarttech.com/st/en-US/Products/SMART+Ideas/

- **Voicethread** – "A VoiceThread is an online media album that can hold essentially any type of media (images, documents and videos) and allows people to make comments in 5 different ways - using voice (with a microphone or telephone), text, audio file, or video (with a webcam) - and share them with anyone they wish. The company provides a limited free version and fee based professional version (~$60.00 a year) – read the pricing page for details. http://voicethread.com/#home

- PowerPoint

Tutorials and Samples
- **Apple Podcasting in Education Video Series** - http://www.apple.com/education/resources/podcastingvideos/

- **Digitales** – digital storytelling resource site - http://www.digitales.us/

- **Digital Clubhouse Network** – community based story-telling project that is looking for individuals from all age groups and walks of life to share their stories. They offer all of the tools for free to those who what to participate in the community. http://www.digiclub.org/

- **Telling their stories**: Oral history archives project – site contains a collection of digital interviews conducted by high school students. http://www.tellingstories.org/

- **Who's Using Podcasting in Education and How** – site maintained by Fordham University Center for Professional Development. http://www.podcastforteachers.org/Who'sUsingPodcastingInEducationAndHow.htm

Resources

- Anderson, L.W., and D. Krathwohl (Eds.) (2001). A Taxonomy for Learning, Teaching and Assessing: a Revision of Bloom's Taxonomy of Educational Objectives. Longman, New York.

- Blooms Revised Taxonomy. Retrieved July 29, 2008 from Kurwongbah State School website http://www.kurwongbss.qld.edu.au/thinking/Bloom/blooms.htm

- Carneson, J., Delpierre, G. Masters, K. (1996). Designing Multiple Choice Questions. Retrieved July 29, 2008, from University of Cape Town website http://web.uct.ac.za/projects/cbe/mcqman/mcqman01.html

- Churches A, 2007, Edorigami, blooms taxonomy and digital approaches http://edorigami.wikispaces.com/Bloom%27s+and+ICT+tools

- Cruz, E. (2003). Bloom's revised taxonomy. In B. Hoffman (Ed.), *Encyclopedia of Educational Technology.* Retrieved August 5, 2008, from http://coe.sdsu.edu/eet/Articles/bloomrev/start.htm

- Flat Classroom Project 2007 http://flatclassroomproject.wikispaces.com/Rubrics

- Forehand, M. (2005). Bloom's taxonomy: Original and revised.. In M. Orey (Ed.), Emerging perspectives on learning, teaching, and technology. Retrieved June 20, 2008 from http://projects.coe.uga.edu/epltt/

- Leaman, R. (2008). Top 12 Mind Mapping Tools for Web or Desktop. Retrieved July 21, 2008, from Wild Apricot's non-profit technology blog http://www.wildapricot.com/blogs/newsblog/archive/2008/07/21/top-12-mind-mapping-tools-for-web-or-desktop.aspx

- Martin, J. (2001). Bloom's learning domains. In B. Hoffman (Ed.), *Encyclopedia of Educational Technology.* Retrieved June 20, 2008, from http://coe.sdsu.edu/eet/Articles/BloomsLD/start.htm

- Models – Course Development. Retrieved July 29, 2008, from Oregon State University, PDT Course Development Extended Campus website http://oregonstate.edu/instruct/coursedev/models/id/taxonomy/

- Oz-TeacherNet. (2001). oz-TeacherNet: Teachers helping teachers: Revised Bloom's Taxonomy. Retrieved June 20, 2008 from http://rite.ed.qut.edu.au/oz-teachernet/index.php?module=ContentExpress&func=display&ceid=29

- Taxonomy of Educational Objectives. Retrieved August 6, 2008, from Wikipedia http://en.wikipedia.org/wiki/Taxonomy_of_Educational_Objectives