

# THE **e**LEARNING DEVELOPERS' JOURNAL

Strategies and Techniques for Designers, Developers, and Managers of eLearning

## THIS WEEK — DESIGN STRATEGIES

### Constructing Knowledge: Tools for Learners

BY BILL BRANDON

*"In a time of drastic change it is the learners who inherit the future. The learned usually find themselves equipped to live in a world that no longer exists."*

— Eric Hoffer

Learning happens, according to some philosophers and researchers, when there is a change in meaning, new ideas, or concepts constructed from prior knowledge and experience. Individuals construct knowledge — they learn — as they solve problems, usually through collaborating with other people.

In times of change, people learn by dealing with hard problems in the real world. These are nearly always ill-formed problems, where it is probable that no one answer will satisfy everyone, and pat "school" answers will satisfy no one. This is where the constructivist approach introduced in my previous article in **The Journal** ("How Do People Learn? Some New Ideas for e-Learning Designers," June 1, 2004) may be extremely useful in supporting the learning process.

For an e-Learning designer considering whether to adopt a constructivist approach for a particular project, there are

a few issues to deal with:

First, the constructivist design perspective is quite different from "learning as usual," in that the goal of design is to support the learner in building and creating knowledge, not to support the efficient transmission of knowledge from a teacher, text, or tutorial to the learner. Furthermore, the perspective on technology in a constructivist design is not "e-Learning as usual," wherein a layer of technology packages and then presents knowledge to the learner. The role of technology is to help the learner solve problems — as David Jonassen observes, it's the thinking that mediates learning, not the technology.

The specific technology used when applying constructivism in an online setting — the applications, the online environment, the social engineering — includes new software. It also involves using familiar software (such as spread-

*We are used to designing e-Learning applications to deliver instruction through technology. A more recent approach, constructivism, makes a different use of technology by providing software tools to learners to support meaningful learning. Read this article to find out what meaningful learning is, and how technology can engage learners in activities that will help them make meaning. You'll be hearing more about this as our understanding of learning and knowledge continues to converge!*

in Table 1, below. Notice that each of the software types has some potential for application in each of the problem solving functions. This is not to imply that every tool will be used for every problem, or that six different tools will be used together in every stage of problem solving. Making the appropriate selection is the job of the designer. In some cases, the content management system selected (for example) will include tools for Web publishing and support for community discussions.

In the discussion that follows, some of the tools and their associated learning activities will be briefly discussed. Some learning activities (WebQuests, in particular) are potentially important enough within the constructivist framework that an

entire article will be devoted to them at a later time.

### Concept maps and mind maps

Concept maps and mind maps are used to represent mental models. In the problem solving process, they can also be used to map existing knowledge for a learner or group of learners, as an aid in deciding what information needs to be obtained by intentional searching. Another use of maps is for modeling alternative solutions in order to predict outcomes or evaluate consequences. Finally, a map of the completed mental model can be an important part of presenting and testing the selected solution.

A concept map visually represents how ideas within a given domain (field of activ-

ity) relate to each other. A learner can connect new knowledge, as it is acquired, to what is already known by adding the new ideas to the concept map.

Physically, a concept map is a diagram consisting of hierarchically arranged nodes or cells. Each cell is indicated by a box or a circle that contains a concept, an item, or a question. Cells are linked to each other with arrows that indicate the direction of the relationship. Each arrow is labeled with a word, symbol, or phrase describing the relationship. (For an example, see the article by Joseph Novak, listed in the References section at the end of this article.)

Concept mapping has its basis in the work of David Ausubel on the ways that individuals learn from presentations in a

**TABLE 1** Software tool categories for constructivist designs: Some applications within collaborative problem solving

(Note: This table refers to uses by learner(s) to solve problems, not by instructors or facilitators to present information or knowledge. In any given learning engagement, not all of the tools will necessarily be used.)

Problem-solving functions (after Jonassen)	Software tool categories					
	Concept and mind maps	Web publishing	Community systems	Office-type applications	Hypermedia applications	Content and course mgt.
<b>Intentional information searching</b>	<ul style="list-style-type: none"> <li>Plan — what are the learners looking for and why</li> </ul>	<ul style="list-style-type: none"> <li>Report and evaluate what is found as to relevance and credibility</li> </ul>	<ul style="list-style-type: none"> <li>Develop strategies for searching</li> <li>Triangulate sources</li> <li>Discussions</li> <li>Social space for conversation, collaboration, and consensus-building</li> </ul>	<ul style="list-style-type: none"> <li>Web searches with browsers</li> <li>Design and execute WebQuests</li> <li>Email for contacts not on the community system</li> <li>Data collection</li> </ul>	<ul style="list-style-type: none"> <li>Presentation of search results</li> </ul>	<ul style="list-style-type: none"> <li>Modeling and communicating</li> <li>Administration</li> </ul>
<b>Modeling tasks or content</b>	<ul style="list-style-type: none"> <li>Build representations of mental models</li> </ul>	<ul style="list-style-type: none"> <li>Present ideas about content and models</li> </ul>	<ul style="list-style-type: none"> <li>Discussions</li> <li>Brainstorming</li> <li>Social space for conversation, collaboration, and consensus-building</li> </ul>	<ul style="list-style-type: none"> <li>Financial modeling</li> <li>Presentation</li> <li>Knowledge bases</li> </ul>	<ul style="list-style-type: none"> <li>Presentation of models</li> </ul>	<ul style="list-style-type: none"> <li>Modeling and communicating</li> <li>Administration</li> </ul>
<b>Decision-making</b>	<ul style="list-style-type: none"> <li>Model the alternative solutions</li> <li>Predict outcomes</li> <li>Evaluate consequences</li> </ul>	<ul style="list-style-type: none"> <li>Present alternatives or proposals</li> </ul>	<ul style="list-style-type: none"> <li>Discussions</li> <li>Brainstorming</li> <li>Social space for conversation, collaboration, and consensus-building</li> </ul>	<ul style="list-style-type: none"> <li>Presentations</li> <li>Model outcomes</li> </ul>	<ul style="list-style-type: none"> <li>Presentation of alternatives and criteria</li> </ul>	<ul style="list-style-type: none"> <li>Modeling and communicating</li> <li>Administration</li> </ul>
<b>Designing solutions</b>	<ul style="list-style-type: none"> <li>Model the selected solutions</li> </ul>	<ul style="list-style-type: none"> <li>Present the design</li> </ul>	<ul style="list-style-type: none"> <li>Discussions</li> <li>Brainstorming</li> <li>Social space for conversation, collaboration, and consensus-building</li> </ul>	<ul style="list-style-type: none"> <li>Presentations</li> <li>Financial modeling</li> </ul>	<ul style="list-style-type: none"> <li>Presentation of solutions and results</li> </ul>	<ul style="list-style-type: none"> <li>Modeling and communicating</li> <li>Administration</li> </ul>

- Concept and mind mapping software is sometimes referred to as semantic network applications.
- Web publishing includes weblogs and other content systems not requiring HTML expertise for use.
- Community systems include Wikis. Some community systems include weblogs and other Web publishing features.
- Office-type applications include spreadsheets, databases, word processors, Web browsers, and presentation software.
- Hypermedia applications include HTML editors and other applications capable of linking files on a network.
- Content and course management applications include CMS systems and content management architectures.

school setting. In other words, strictly speaking, Ausubel's ideas relate to reorganization of existing cognitive structures, not to development of new structures (which is a constructivist concept). However, Joseph Novak at Cornell University, who in 1983 originated the theory underlying concept maps, notes that concept maps are useful in the contexts of cooperative learning in schools, of curriculum planning in higher education, and of problem solving in businesses. This is very similar to constructivist ideas, and concept maps can be used to support learning through problem solving.

Mind maps are a similar idea, with a slightly different implementation. A mind

map has only one main concept, while a concept map can have several main concepts. Another way to think of this is that a mind map can be represented as a tree, but a concept map may require a network-type diagram to visually describe the relationships between concepts. For an example of a mind map, see [http://www.mind-map.com/\\_metacanvas/attach\\_handler.uhtml?attach\\_id=160&content\\_type=image/png](http://www.mind-map.com/_metacanvas/attach_handler.uhtml?attach_id=160&content_type=image/png).

The originator of mind maps, Tony Buzan, conceived of them as an aid to memory as well as for problem analysis and problem solving. While the memory aid role is of limited use in more advanced learning applications, the prob-

lem-solving features are certainly of interest in constructivist applications.

Traditionally, mind maps are used in instructor-led activities as a means of taking notes, and have probably been most popular as a tool for "accelerated learning." However, there is no reason why they could not be used as a systematic way to document knowledge creation.

### **Knowledge construction: Concept mapping software**

Concept mapping software has been available online in academic settings for several years. One of the early tools, KMap, originated in 1995 at the University of Calgary but is no longer available;

**TABLE 2** *Concept and mind mapping software*

Type	Application	Web site	Notes
<b>Concept maps</b>	CmapTools	<a href="http://cmap.ihmc.us/">http://cmap.ihmc.us/</a>	<ul style="list-style-type: none"> <li>• Software toolkit</li> <li>• Proprietary license</li> <li>• Windows, Linux (Intel), Solaris (Sparc)</li> </ul>
	SMART Ideas	<a href="http://www.smarttech.com/products/smartideas/index.asp">http://www.smarttech.com/products/smartideas/index.asp</a>	<ul style="list-style-type: none"> <li>• Independent use or classroom use with SMART Board Interactive Whiteboard</li> <li>• Exports finished maps to MS Word or to HTML documents</li> <li>• Proprietary license</li> <li>• Windows or Mac OS X</li> </ul>
	Knowledge Manager	<a href="http://www.knowledgemanager.us/">http://www.knowledgemanager.us/</a>	<ul style="list-style-type: none"> <li>• EU product</li> <li>• Designed specifically for knowledge construction</li> <li>• Application required in order to read finished maps</li> <li>• Proprietary license</li> <li>• Windows</li> </ul>
	The Brain	<a href="http://www.thebrain.com">http://www.thebrain.com</a>	<ul style="list-style-type: none"> <li>• Optimized for collection and linking of information from a wide variety of sources.</li> <li>• Personal and enterprise versions</li> <li>• Proprietary license</li> <li>• Windows</li> </ul>
<b>Mind maps</b>	FreeMind	<a href="http://freemind.sourceforge.net/">http://freemind.sourceforge.net/</a>	<ul style="list-style-type: none"> <li>• Requires Java 1.4 or higher</li> <li>• Open Source (GPL)</li> <li>• Windows, Mac OS X, Debian Linux, SuSe (9.0) Linux</li> </ul>
	Inspiration	<a href="http://inspiration.com/home.cfm">http://inspiration.com/home.cfm</a>	<ul style="list-style-type: none"> <li>• Does outlines and mind maps</li> <li>• Proprietary license</li> <li>• Windows, Mac OS X, Palm OS</li> </ul>
	MindGenius	<a href="http://www.mindgenius.com">http://www.mindgenius.com</a>	<ul style="list-style-type: none"> <li>• Based directly on Tony Buzan's Mind Mapping®</li> <li>• Separate versions for business, education, and home use, plus a complementary brainstorming product called Brainbloom</li> <li>• Requires application or viewer to open completed maps</li> <li>• English and German versions</li> <li>• Proprietary license</li> <li>• Windows</li> </ul>
	Visual Mind	<a href="http://www.visual-mind.com/">http://www.visual-mind.com/</a>	<ul style="list-style-type: none"> <li>• Maps very similar to MindGenius</li> <li>• English, Danish, Norwegian versions</li> <li>• Proprietary license</li> <li>• Windows</li> </ul>
	MindManager	<a href="http://www.mindjet.com/us/">http://www.mindjet.com/us/</a>	<ul style="list-style-type: none"> <li>• Marketing not primarily aimed at the e-Learning market, but it is positioned as a problem-solving support tool</li> <li>• Proprietary license</li> <li>• Windows, Pocket PC versions</li> </ul>

allows the user to link items across concepts, to provide additional context and meaning.

The Brain comes in two versions: PersonalBrain is intended for individual use and allows integration of personal content with Web content. PersonalBrain was used in creation of this article, for example. I was able to organize my notes and capture Web content and URLs in a PersonalBrain file during the research phase. The other version of The Brain is BrainEKP (Enterprise Knowledge Platform), which supports online collaboration to produce a single concept map.

### **Knowledge construction: mind mapping**

Software for mind maps is easy to find online, both as Open Source and as commercial products. Most of these are virtually identical in their functionality, with the main differences being price, platforms supported, and language support. In my unscientific review of comments left in online forums and weblogs, FreeMind and Inspiration get the highest marks from users. All of the applications offer some kind of free trial, so it should be possible to decide which one comes closest to meeting your needs. The five applications listed here are summarized in the lower half of Table 2 on page 6.

### **FreeMind**

FreeMind is a free mind mapping application written in Java. Similarly to The Brain, the authors of FreeMind primarily promote the application as a personal knowledge base, to do list, or prioritizer. However, its operation makes it a clear member of the mind mapping group. FreeMind is said to be a very fast application.

### **Inspiration**

Inspiration is probably known to many readers, due to its long history, and its association with the Mac platform. It is designed for use in education, but many writers and businesses use it as well.

Furthermore, the perspective on technology in a constructivist design is not "e-Learning as usual," wherein a layer of technology packages and then presents knowledge to the learner. The role of technology is to help the learner solve problems — it's the thinking that mediates learning, not the technology.

Inspiration is a bit different from the other applications here, in that it does both outlining and mind mapping. As such, one of the common uses for Inspiration is for learners to plan their own presentations or problem solution implementations.

### **MindGenius**

MindGenius is probably the most direct implementation of Tony Buzan's concept of mind mapping. One potential drawback to MindGenius is that either the application or MindGenius Viewer is required if you want to open a mind map file. MindGenius Viewer cannot edit MindGenius files.

### **Visual Mind**

Like the other mind mapping applications, Visual Mind is designed for use in education and in business. It is very similar, visually, to MindGenius.

### **MindManager**

MindManager has had some attention in the computer press in the last few months, and as with the concept mapping and the mind mapping group, it has been promoted as a "visual tool for brainstorming and planning." The feature set is the same as for the previous mind mapping tools.

### **Web publishing tools**

At the individual level, one of the important ways that we have to tell

whether someone has truly learned something is by how well they can articulate meaning. This is also a key skill in problem solving, as individuals report their evaluation of information they obtained during a search, present their ideas about models, lay out alternatives or proposals for solutions, or present a final design.

In the Web, we have recently seen the rapid growth in the number of weblogs (sometimes referred to simply as "blogs"). While it is true that many of these weblogs are fairly superficial in their depth, intellectually immature, and evanescent, it is also true that many of the most serious thinkers today communicate important ideas and discoveries, ask for comments and input, and propose actions through a weblog.

Weblogs have already found a home in education, especially in teaching writing skills at the secondary level and in colleges. This trend in learning through Web publishing (for that is what weblogs are) will continue to grow. Weblogs are easy to use; they require no knowledge of HTML and only the most basic mastery of a Web browser will allow a learner to both publish ideas and findings and to read the ideas and findings of others.

Kathleen Gilroy, of The Otter Group, commented on May 10, 2004 that her company has been using weblogs successfully as the "course management" system for e-Learning programs this year.

**TABLE 4** *Community systems*

Application Name	Web site	Notes
WikiWiki	Basic information <a href="http://www.c2.com/cgi/wiki?WikiWikiWeb">http://www.c2.com/cgi/wiki?WikiWikiWeb</a>  Choosing a Wiki <a href="http://www.c2.com/cgi/wiki?ChoosingaWiki">http://www.c2.com/cgi/wiki?ChoosingaWiki</a>	Many Wikis are Open Source, but not all, and very few are "freeware" — almost all of them require a license, even if there is no fee for their use.
coWiki	<a href="http://develnet.org/">http://develnet.org/</a>	Creates a collaborative website, with features of both weblogs and Wikis. Designed to be more secure and more structured than a Wiki.

She reports, “We are getting much more discussion on the weblog than we had on our course discussions system. I think the reason for this is that people get exposure on the weblog that they did not get on the email discussion list; therefore they are much more motivated to participate. We also have found that the weblog is better at capturing what is going on [at] the level of peer-to-peer than other tools we have used. In fact, I think the distinction between e-Learning and KM disappears when you re-frame them both as peer-to-peer learning and knowledge tools.” (See the entire conversation at [http://billives.typepad.com/portals\\_and\\_km/2004005/since\\_the\\_begin.html](http://billives.typepad.com/portals_and_km/2004005/since_the_begin.html). Incidentally, this site is hosted on TypePad, one of the hosted individual weblogs discussed below.)

If you are unfamiliar with weblogs and their use in facilitating learning, I recommend the articles by Brian Lamb and Maish Nichani listed at the end of this article.

There are two basic types of weblogs, and I have summarized information about several of each type in Table 3 on page 7.

Hosted individual weblogs, especially Blogger weblogs, are probably already familiar to you. Most of these weblogs use a browser-based interface, which means that the user does not need any software other than a browser running on her machine. They can be edited and read from anywhere. The exception is Radio, which offers more features than

most of the others in this category and requires a client application in order to add new posts, edit existing posts, and use the various tools. Notwithstanding, Radio is enormously popular.

The other group is what I have referred to in Table 3 as weblog community content management systems. These are actually systems for managing web sites and content, and they normally run on your servers. Whether they are publicly accessible from the Web is controlled by you; many companies operate “internal weblogs” on their intranet using one of these systems. Of the four listed, Drupal and PostNuke are the most powerful. Drupal also supports various configurations. For example, Drupal can be set up so that users can moderate discussions by voting on individual posts. If a user acts badly on the board, other users can vote and the bad actor’s posts will no longer appear on the board (an administrator can reverse this). An implementation of Drupal specifically for e-Learning purposes, called DrupalEd, has been made available in the last week, and can be found through the Drupal site.

### Community systems

One of the most natural ways that people work together to solve problems and achieve goals is through communication. This activity also helps to form communities, including communities of practice.

As you might expect, there are some thriving learning communities on the

Web, and (maybe not surprisingly) most of them have no real connection with any formal training organization or institution of higher learning. Along with The eLearning Guild, Perl Monks (<http://www.perlmonks.org>) and Wikipedia ([http://en.wikipedia.org/wiki/Main\\_Page](http://en.wikipedia.org/wiki/Main_Page)) are examples of such communities.

Perl Monks is, of course, the product of a lot of script and probably not the kind of community system you would want to have to create from scratch. On the other hand, Wikipedia is a Wiki, and many different varieties of Wiki are available and relatively easy to set up.

Wikis are a little hard to describe, but their key feature is that anyone can change anything at any time. There are some safeguards against vandals and irresponsible users, but for the most part these are not needed. Maintenance of a large Wiki can be a challenge, however, since people do make well-intentioned (but unwise) changes.

If the somewhat anarchic structure of a Wiki worries you, consider coWiki, which is designed to be more secure. In either case, I suggest visiting the Web sites listed in Table 4 on page 8, and also Wikipedia, to become more familiar with the way these communities function. A number of educational establishments have started to experiment with Wikis and report varying levels of success. I am aware of two companies that are using Wikis internally as part of their knowledge management efforts.

**TABLE 5** *Open Source collaborative environments*

Application Name	Web site	Notes
.LRN Tools	<a href="http://dotlrn.org">http://dotlrn.org</a>	Designed to support learning and research communities and communities of practice. Capabilities include course management, online communities, learning management, and content management. Requires OpenACS toolkit.
OpenACS toolkit	<a href="http://openacs.org">http://openacs.org</a>	Toolkit for building scalable, community-oriented Web applications. OpenACS is the foundation for many products, including .LRN and other learning-related applications.
Claroline	<a href="http://www.claroline.net/">http://www.claroline.net/</a>	Collaborative learning environment, supporting the creation and administration of courses through the Web. Includes group management, forums, document repositories, calendar, chat, assignment areas, links, and user profile administration. Scales up extremely well – Universities in Europe with 20,000 students use it with no problems. Available in 28 languages.
Moodle	<a href="http://moodle.org/">http://moodle.org/</a>	Course management system for creating quality online courses or Virtual Learning Environments (VLEs). Promotes collaboration, activities, and critical reflection. Suitable for online courses and for supplementing instructor-led classroom instruction. Used around the world, primarily by educators. Available in 40 languages.
Segue	<a href="http://segue.middlebury.edu/index.php?action=site&amp;site=segue">http://segue.middlebury.edu/index.php?action=site&amp;site=segue</a>	Content management system designed for collaborative e-Learning. Supports weblogs, courses, news, journals, peer review, and e-portfolio, and can serve as a portal

# About the Guild



## The eLearning Guild™ is a global Community of Practice

Through this member-driven community of designers, developers, and managers of e-Learning, the Guild provides high-quality learning opportunities, networking services, resources, and publications.

Guild members represent a diverse group of instructional designers, content developers, web developers, project managers, contractors, consultants, managers and directors of training and learning services – all of whom share a common interest in e-Learning design, development, and management. Members work for organizations in the corporate, government, academic, and K-12 sectors. They also are employees of e-Learning product and service providers, consultants, students, and self-employed professionals.

The more than 12,000 members of this growing, worldwide community look to the Guild for timely, relevant, and objective information about e-Learning to increase their knowledge, improve their professional skills, and expand their personal networks.

### Resource Directory

The Guild hosts the e-Learning industry's most comprehensive resource management system that includes more than 4,500 (and growing) e-Learning related resources in a searchable database. Guild Members can post resources and can update them at any time.

### Surveys & Studies

The eLearning Guild conducts continuous polls and more than a dozen surveys and studies each year – including an annual salary survey. Guild Members have unlimited access to all data and analyses.

### The eLearning Developers' Journal

The Journal provides in-depth articles about how e-Learning professionals can make e-Learning more successful in their organizations. It's a weekly online publication in PDF format and Guild Members have unlimited access to the searchable archive of every issue published.

### Job Board

The Guild Job Board should be your first stop for solving employment related issues. Whether you are an employer looking to fill a key position or an e-Learning professional looking for a new job, you'll find success here.

### Info Exchange

The Info Exchange enables members to ask questions of, and get feedback from, other members around the world in a discussion board format.

### Member Discounts

Guild Members receive a 20% discount on all optional services offered by The eLearning Guild that are not included in your membership. These services include all face-to-face and online events produced by the Guild, special publications, and other services as they are developed.

### The Online Forum Series

e-Learning for e-Learning professionals! *The Guild Online Forum Series* enables you, or your team, to explore the most pressing issues facing e-Learning professionals today with some of our industries smartest people – right from your desktop or conference room.

### Engaging Symposia

The Guild's unique and focused symposia drill into the most critical issues for e-Learning designers, developers, and managers. These are

intensive learning events with limited enrollment. Participate in person or online, as an individual or as part of a team.

### Annual Conference

*The eLearning Producer Conference*, held in the fall each year, offers comprehensive and in-depth content for all e-Learning professionals in a collegial environment conducive to learning and sharing.

### Event Proceedings

If you attend a Guild event, you have immediate access to all event proceedings. If you do not attend, as a Guild Member you still have access to the proceedings 90 days after an event ends.

### Guild e-Clips

A Guild Members-only publication sent by email every week. It's short, easy to read, and includes "clips" designed to keep members connected to the latest information about Guild publications, surveys & studies, and learning events.

### eLearning Insider

The *eLearning Insider* is sent by email every other week and includes current e-Learning industry news, excerpts from Journal articles, highlights from Guild surveys, e-Musings, and information on Guild matters.

### Professional Development Through Active Engagement

In order to maintain a vital community and provide relevant information, The eLearning Guild seeks the active involvement of all Guild Members and Guild Associates. Consider these ways to engage:

**Speak at Guild Events:** Members and Associates are encouraged to submit presentation proposals for any and all Guild events.

**Write for the Journal:** *The eLearning Developers' Journal* articles are written by industry leaders and practitioners just like you who are working in this field every day.

**Join the Program Advisory Committee:** This committee works to craft the program content of all events produced by the Guild.

**Join the Research Advisory Committee:** This committee works to identify the topics for Guild surveys and studies, and also develops the survey instruments.

The eLearning Guild organizes a variety of industry events focused on participant learning:

The eLearning Guild's  
**ONLINE FORUM**  
SERIES

THE eLEARNING  
**FLASH DEVELOPER'S**  
SYMPOSIUM™

The eLearning  
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