

Compiled List of Tool Recommendations from Delphi Survey, Round One

The goal of our gap analysis is to identify existing Web tools used by Engineering instructors as well as needed Web tools that do not exist. To date, we have marketed this analysis nationally to Engineering instructors, generating a panel of 67 participants. See the project Web site for a complete list of participants: <http://www.edtech.vt.edu/dlnet/> We have completed the first of two online Delphi surveys (see Appendix A). The compiled results of the first survey are included in this report.

Processing the Round One Data

To help describe the Round One recommendations, we asked the question, "What makes the item described a 'Web' tool?" For instance, some faculty recommended Photoshop. This software is not a Web tool, but the software or system that allows an instructor to post images online, and students to access this information, is a Web tool.

To sort the recommendations, we asked the question, "Who does the tool benefit most?" Three categories emerged during the filtering process: faculty tools (F), student tools (S), or tools that benefit both equally (B). If a tool benefits "both," we also asked the question, "Is there a situation when the instructor and students would use this tool for different purposes?" If "Yes," then the tool was sorted twice under the "instructor" and "student" categories, because the instructor might rate such tools highly to serve their purposes, but low to serve student purposes, or vice versa.

After initially sorting the tools into instructor, student, and instructor + student categories, the submissions were sorted again into categories that more meaningfully represented the tool functions: tools to create Web content (C), tools to disseminate or retrieve Web content (D), tools to process Web content (P), tools to collaborate or work with others (W), assessment tools (A), and course management tools (M).

Next Steps: Round Two and Beyond

The round two survey will be distributed on March 23rd. During round two, we will ask faculty to rate the compiled list of tool recommendations using a standard Likert scale:

Rate the extent to which you agree with the following statements.
 strongly disagree disagree neutral agree strongly agree

At the end of round two on April 13th, the text-based, Likert scale will be changed into the following numeric scale (strongly disagree=1, disagree=2, neutral=3, agree=4, strongly agree=5). Tools that receive a mean rating of 3 or lower will be discarded from the final reported lists. Tools with a mean rating higher than 3 will be rank-ordered by value.

We will generate one ranked list of preferred Web tools from the ratings of all panelists. We will also generate several discipline-specific lists of preferred Web tools from the ratings of panelists in specific disciplines (e.g., mechanical, civil, industrial, etc.).

We anticipate three potential uses for the final rated lists. First, panelists and other visitors to our Web site will be able to annotate or "mark-up" the final rated lists, appending various curricular ideas for the tools to model best online teaching practices in Engineering. Second, the features will be linked to representative tools when available to help course instructors identify appropriate systems and to help courseware developers identify features that need to be added to learning management systems. Finally, the features will be linked to representative tools or pertinent knowledge objects deposited into the DLNET Engineering content portal to suggest mechanisms by which students may process information more actively.

The timeline for round two and follow-up activities is as follows:

- March 23, round two survey distributed
- April 13, round two survey completed
- April 30, round two data processed and lists reported on project Web site
- June 1, annotation or "mark-up" of Web lists begins by panelists and site visitors
- June 1, Web lists linked to representative tools
- Future, Web lists linked to DLNET tools and objects where appropriate

Tools to Create Web Content (C)

Faculty Tools (F) to Create Web Content (C)

C-F-1	I need a content development tool to create Web-ready documents containing predominantly text and images. Sample software tools in this category include: Adobe Acrobat for creating PDF files; Frontpage, Dreamweaver, Netscape Composer, Word, or an HTML editor for creating standard Web files.
C-F -2	I need a content development tool to create Web-ready documents with mathematical equations; to write equations and math symbols as fast as writing regular text. Sample tools in this category include LaTeX and MathEQ.
C-F -3	I need a content development tool to scan print-based documents, and save these in Web-readable formats (e.g., HTML, PDF).
C-F -4	I need a content development tool to capture computer screen images and place them on the Web.
C-F -5	I need a content development tool to write on a whiteboard or smartboard, then immediately post these course examples, notes, or exercises on the Web; reduces the amount of time needed to prepare materials.
C-F -6	I need a content development tool to create Web-readable, static or animated graphics, or 3-dimensional objects. Sample software tools in this category include: Photoshop, Visual Basic for online modeling; Jwave or LiveMath for turning data into 3-D surface images, X-Y plots, polar plots, animations, contours, etc.; Flash, Video Studio, or Ray Dream Studio for creating animated sequences; or virtual reality markup language (VRML).
C-F -7	I need a content development tool to create Web-ready tutorials or demonstrations of processes for students to read, view, or self-study (e.g., demos of concepts like radioactive decay chains). Sample software tools in this category include: Toolbook Instructor, Director, and Authorware.
C-F -8	I need a content development tool to create audio and/or video content for Web delivery. Various software tools in this category include: Real Presenter, Real Producer, and Netshow, to capture audio and video from classroom lectures for streaming, and to coordinate or synchronize these files with associated slides or drawings that were displayed during the lecture (e.g., narrated slides).

Student Tools (S) to Create Web Content (C)

C-S-1	My students need content development or information generating tools to create Web-ready documents containing predominantly text and images.
C-S-2	My students need a content development or information generating tool to create Web-ready documents with mathematical equations; to write equations and math symbols as part of homework assignments. Sample programs in this category include: MathEQ.
C-S-3	My students need content development or information generating tools to create Web-readable, static or animated graphics, or 3-dimensional objects.
C-S-4	My students need content development or information generating tools to create audio and/or video content for Web delivery.

Tools to Disseminate or Retrieve Web Content (D)

Faculty and Student Tools (B) to Disseminate or Retrieve Web Content (D)

D-B-1	I need an information dissemination tool to post my course schedule, calendar, and/or syllabus online. My students will be able to quickly access this information on campus or in their homes.
D-B-2	I need an information dissemination tool to post my lecture notes, examples, whiteboard images from class sessions, or Powerpoint slides, online. My students will be able to quickly access this information if they missed class or desire lecture materials for self-study.
D-B-3	I need an information dissemination tool to post my homework assignments, lab assignments, problems, or exercises online, and my students to access, print, or download this information to complete outside of class time. Answers and solutions to the assignments may also be posted online. This category includes such tools as Labview and Mathcad through which the instructor constructs exercises for students to download and run on their computers.
D-B-4	I need an information dissemination tool to post my learning objectives for exams and quizzes, old print-based exams, and/or solutions to the questions online. My students can access, print, or download this information to practice for upcoming exams.
D-B-5	I need an information dissemination tool or database to post course content online in various formats for students to view, download, or stream to their desktops. This might include text, image, graphic, animation, audio, or video files, in addition to external Web links or tutorials. In some cases, students might need a plug-in to view the files (e.g., Real Player).
D-B-6	I need an information dissemination tool that allows my students and I to demonstrate applications or events synchronously or in real-time over the Web (e.g., screen sharing features to demonstrate an application or to train others in the use of an application; live Web cams to broadcast laboratory experiments, outdoor construction activity, field trips).
D-B-7	I need a virtual library with full journal article access, allowing my students and I to search content in specific course areas (e.g., thermodynamics, heat transfer, etc.).
D-B-8	I need archival tools to clip or save portions of asynchronous communications (e.g., e-mails, discussion board transcripts) for the purpose of saving and sharing particularly good discussions with future students.
D-B-9	I need archival tools to record synchronous communications (i.e., live chat and live audio/video sessions) for students to replay and review whenever they miss a session or whenever they desire a slower playback for better processing of the content. "Persistent" chat would allow a student to access all the previous messages that were typed in the order they were typed.

D-B-10	I need archival tools to save student questions for the purpose of generating a frequently asked questions (FAQ) database for my course. Students might be provided with a discussion board or listserv to post their questions. After finding questions that students ask repeatedly or issues that cause difficulty, I can move those items to a FAQ database with a standard response or study advice for all to view.
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Tools to Process Web Content (P)

Student Tools (S) to Process Web Content (P)

P-S-1	My students need seeking tools to search for online information (e.g., search engines); advanced filtering or "recommender systems" that retrieve and sort relevant online literature and industry news according to criteria defined by the students; a customizable search engine to meet the discipline-specific research needs of individuals or collaborative teams.
P-S-2	My students need collecting tools to store online information that they find during research (e.g., collecting facts, text, pictures, video clips, or links that are related to some concept or topic). Bookmarking tools and individual file space are types of collecting tools.
P-S-3	My students need organizing tools to sort and arrange the online information that has been collected or exchanged (e.g., online concept mapping or diagramming tools that can be edited by a group over the Web).
P-S-4	My students need integrating tools to merge their ideas and thoughts with online content (e.g., web annotation software for students to post notes or questions directly on a Web site, or to mark-up or leave critiques directly on a Web site; ability to attach a sketch or graphic image to a portion of a Web site for the purpose of elaborating on the original document).
P-S-5	My students need manipulation or simulation tools to interact with models, events, or calculations that I've created (e.g., java applets that allow students to modify variables in water quality models, rainfall-runoff models, heat transfer models, or other phenomena to better explore relationships and visualize results; LiveMath or MatLab modules placed online that allow students to change mathematical input expressions and observe resulting changes on graphs and 3-D images).
P-S-6	My students need manipulation or simulation tools to explore spatial relationships (e.g., modifying shapes to create products for which assembly instructions could be written).
P-S-7	My students need manipulation or simulation tools that provide them with virtual laboratory experiences (e.g., troubleshooting electronic circuit components, practicing on virtual SEM or TEM lab apparatus, etc.).
P-S-8	My students need an interactive, problem-solving tool to formulate and solve problems online, showing various steps and calculations as if done by hand on paper. The problem components should be interrelated like a spreadsheet, so when one part of the solution is changed, other dependent parts also change accordingly.
P-S-9	My students need data processing and visualization tools to process raw scientific data, visually interpret results, create models, etc. Sample tools in this category include: JWAVE for distributed processing of large scientific data sets from multiple computers, or MatLab.

Tools to Collaborate or Work with Others (W)

Faculty Tools (F) to Collaborate or Work with Others (W)

W-F-1	I need a student grouping tool to create student teams.
W-F-2	I need an instructor-to-instructor file exchange tool to share files with other instructors teaching similar courses. The tool could facilitate the development of a shared library, database, or archive of instructional modules that could be purchased or reused to create new courses, rather than re-inventing these items for each new course. Modules placed in the shared database could be tagged with keywords or topics, so an instructor teaching a specific topic could download relevant materials to auto-generate their new course.

Student Tools (S) to Collaborate or Work with Others (W)

W-S-1	My students need student-to-student file exchanging tools to share documents and to view others' reports and designs. Such tools might resemble a public drop box for the entire class or private drop boxes for project teams. The drop boxes should date and time-stamp posted documents to help students track version changes.
W-S-2	My students need a comprehensive project management system containing most or all of the features mentioned in this survey for groups or teams to collect and exchange information, organize information, generate information, communicate, and plan project processes like issues tracking, approval routing, or change order coordination (e.g., real life project management on construction projects).

Faculty and Student Tools (B) to Collaborate or Work with Others (W)

W-B-1	My students and I need an online communication tool to converse in an asynchronous format. Specific tools might include e-mail, listservs, newsgroups, or threaded discussion boards.
W-B-2	My students and I need an online communication tool to conduct text-based communication in a synchronous format. Specific tools might include live chats or AOL's instant messenger.
W-B-3	My students and I need an online communication tool to conduct audio or video-based communication in a synchronous, real-time format (i.e., I can hear and/or see the students online in real-time; they can discuss projects with their teams; they can present oral briefings to the class; they can ask questions or post questions in a text window; they can view and collaboratively edit a whiteboard). Tools in this category include: Mentergy, Windows NetMeeting, Symposium, and ClassWise.
W-B-4	My students and I need advanced editing and critiquing tools for course file exchange boxes to electronically mark-up documents (e.g., reports, Web pages). Sample features might include the ability to red-line text segments, attach electronic sticky notes, or use an electronic pen and pad to circle mistakes and hand-write comments in the margins. The tool would support both instructor grading of student documents and peer critiquing of one another's work.

W-B-5	My students and I need integrating tools that are part of my communication tools, particularly asynchronous communication tools like discussion boards, so that we can attach drawings, sketches, schematics, programming code, or audio/voice clips, to the otherwise text-based, course discussions. Such tools are useful for elaborating on course discussions or for students to share their work with the instructor or peers for the purpose of receiving feedback or help on their questions.
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Assessment Tools (A)

Assessment Tools (A) for Faculty (F)

A-F-1	I need a student tracking tool to determine which Web pages the students have viewed on my Web site, when, and how often. The data might be used for assessment purposes (e.g., giving credit for completing online exercises) or to determine the content students find most useful. Tracking could be extended to course assignments, allowing the instructor to monitor students' progress as they worked through a series of tasks.
A-F-2	I need a filtering tool to check student work for plagiarism.
A-F-3	I need an online gradebook that interfaces with student tracking data, to correlate quiz/test performance with student access to online materials, tutorials, exercises, etc. (i.e., Did students who score poorly on a test access fewer online resources than students who scored well?).
A-F-4	I need an online survey tool that allows my students to post opinions and feedback regarding the course (e.g., most and least important items learned from a given lecture, instructor performance, TA performance, etc.).
A-F-5	I need a data collection tool to post forms online and capture information from my students in a database. Sample tools in this category include: Cold Fusion Markup Language (CFML) to connect databases to the Web.

Assessment Tools (A) for Faculty and Students (B)

A-B-1	My students and I need a student-to-instructor file exchange tool for students to upload their assignments, reports, or projects. The tool would time-stamp uploaded documents. This tool might represent the student's "portfolio" space where several course-related files are stored.
A-B-2	My students and I need an online quizzing and testing tool to assess their progress in the course. The system should be capable of displaying symbols or equations in both questions and answers. If an instructor deems necessary, the system should allow for questions of increasing difficulty if students continue to perform well, and allow the student to retake an item for less credit if they missed it the first time.
A-B-3	My students and I need an online gradebook to store their grades. Students should be able to access their individual scores in a secure location. The gradebook should be flexible to allow not only numeric scores, but also statements regarding lab performance, demonstration performance, and general comments about student progress. The gradebook should integrate with the university grade reporting system.

Course Management Tools (M)

Course Management Tools (M) for Faculty and Students (B)

M-B-1	My students and I need a pacing tool to scaffold or restrict their access to information on my Web site (e.g., students can't view chapter 3 until they've taken the chapter 2 quiz). Students will not be able to see certain portions of the Web site until a set rule has been met (e.g., a certain date, a passing mark on a test), or students are led to different sections of a Web site based on their response to prerequisite-type questions (i.e., if students lack prerequisite knowledge, they can be led to content serving as remediation).
M-B-2	My students and I need an online course hosting tool to manage many or most of the course functions listed in the survey: information dissemination, quizzing, communication, file exchange. Sample tools in this category include: WebCT, Blackboard, Virtual University, and eCollege.
M-B-3	My students and I need an enterprise system which encompasses and integrates several online courses. Instructors and students log-into the system and can access all of their courses from one main portal (i.e., user-oriented, not course-oriented). Student advisors can track student performance across a program of study, rather than one course alone.

Appendix A: Questions from the Round One Delphi Survey

1. Please enter your name:
2. What EXISTING Web tools do you currently use or recommend to support your TEACHING (e.g., software that stores my lecture notes online, an online gradebook, a digital drop box to place my powerpoint presentations online)?
3. What EXISTING Web tools do you currently provide your students or recommend to support their LEARNING (e.g., discussion boards, note takers, concept mappers, electronic practice quizzes)?
4. What HYPOTHETICAL or planned Web tools would you like to use to support your TEACHING if available? What functions or features are missing or limited in existing tools?
5. What HYPOTHETICAL or planned Web tools would you like to use to support your students' LEARNING if available? What functions or features are missing or limited in existing tools?
6. Do you have any other comments at this time?