

EMERGING TECHNOLOGIES

Web Browser Trends and Technologies

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Introduction: Fundamental Changes on the Way

In the course of the past few years, the Web has become the platform of choice for delivery of educational content, including language learning applications. As the Web has moved from interesting novelty to indispensable tool, Web browsers have expanded dramatically their capabilities, adding the ability to incorporate seamlessly audio/video or "plug-in" applications, to display content in sophisticated layouts, and to interact with the user through client-side scriptability. Through this process of development, the fundamental browsing interface (dedicated browser on a desktop operating system) has remained largely unchanged, as has the page encoding system (various versions of HTML). Now, however, there is change on the horizon in both areas: support for Web browsing on different devices (cell phones, palmtop computers, TV sets) and browser support for the next-generation Web authoring language, [XML](#) ("extensible markup language"). For developers of Web-based language learning materials, new access pathways and encoding systems will provide significant opportunities as well as technical challenges.

Browser Options: Expanding or Coalescing?

It wasn't long ago that Web aficionados waited impatiently for the next beta release of Netscape's Navigator and were more than willing to live with the bugs and crashes for the newly enhanced browsing experience the latest version provided. The recent release of a preliminary ("Preview Release 1") version of Netscape's version 6 browser ([download](#)) has not generated anything like that level of interest. The explanation is not hard to find. Netscape is no longer the dominant browser, defining the cutting edge of the Web experience. Microsoft's Internet Explorer has emerged the winner of the "browser wars" (with up to 75% of the market share, according to a recent [survey](#)), so hyped in the media and refreshed through the Department of Justice action against Microsoft. In part this is due to Netscape's abdication from competition. Rather than release a new version of its browser, Netscape continued to upgrade its version 4 browser for more than a year.

Meanwhile, rival Microsoft delivered a considerably enhanced version 5 browser ([download](#)) with support for emerging Internet standards. Netscape's browser development efforts have centered on the open-source [Mozilla](#) project, which has developed its own browser ([download](#)) and is the basis for Netscape 6 (the "Navigator" and "Communicator" names have been dropped). Although no longer the industry leader, Netscape continues to have a loyal following and significant market share. It also continues to innovate, largely through Mozilla, which, contrary to previous Netscape tendencies, has pursued a standards-based approach to new development. Following one of the emerging trends on the Internet, Mozilla has been coding its browser development whenever possible in XML (rather than one of

the traditional languages for creating user interfaces such as C). This allows for the use of cross-platform standards while minimizing the need for platform-specific code. One of the results is the customizability of Netscape 6 created through the use of [XUL](#), "extensible user interface language," a user interface builder based on XML. This allows for the use of different user interfaces or "skins" for a browser. This enables, for example, a customized browser to be developed for a school or departmental learning lab. A toolkit is [available](#) from Mozilla for this purpose.

While Internet Explorer has been the dominant browser in terms of market share, the options for finding a viable alternative browser have actually grown recently. A popular alternative for Windows user is [Opera](#), while [Icab](#) has attracted a following among Macintosh users. Both are trimmed-down browsers which offer support for a broad range of Web functions, although not duplicating the functionality available in main-stream browsers. They do offer support for some standards, such as CSS 1 (well-supported in Opera) and JavaScript (supported in iCab and Opera). There has also been considerable development of Web browsers for devices other than main-stream operating systems. This method of Web access is expected to increase dramatically in the near future. Assuming audio playback capability in such devices, the potential for mobile language learning is significant. While Microsoft offers a leaner version of Internet Explorer for [Windows CE](#) and the recently introduced Pocket PC hand-helds, most browsers for smaller devices are not modified versions of the big browsers. Most such devices have neither the processing power nor the screen real estate to display adequately Web pages designed for normal PC monitors. As a consequence, recent wireless Web access for devices such as cell phones provides limited Web access for selected Web sites in formats modified from normal display. Palm's [Web clippings](#) use this approach, providing [tools and guidance](#) for Web site developers who want to provide modified versions of their pages for Palm users. [WML](#) or Wireless Markup Language is an effort to provide a standardized method for providing selected Web access for small wireless devices.

Beyond HTML: More Power, More Complexity

Of significant interest in Internet Explorer 5 and Netscape 6 is the support for directly displaying documents written in XML, an encoding system both people and machines can read. The XML support in both browsers is not yet complete, but is a significant development in supporting the emerging standard for Web documents. In fact, HTML, as we have known it since the early 90's, is giving way to an XML version of the Web encoding system.

Instead of the present HTML 4 standard being followed by a version 5, the [W3](#) Corporation, the standards-setting body for the Web, has endorsed [XHTML](#) as the new standard. XHTML (extensible hypertext markup language) is, as one might expect, based on XML; in fact, it is a reformulation of HTML 4 as an application of XML. It was released January 26, 2000 as a "recommendation" by the W3C. XHTML offers the advantages of modularity and extensibility, allowing richer content and display for full-featured browsers and slimmed down versions for mobile devices or set-top boxes (or "smart" refrigerators). What makes this flexibility possible without the necessity of providing individually coded pages for different modes of access is the use of style sheets coupled with a protocol under development called [CC/PP](#) or "Composite Coupling/Preferences Profiles," which allows for description of both user preferences and device capabilities. The idea is that for each Internet-capable device there be a "device profile" on the Web (written in XML meta-data using [RDF](#) or "Resource Description Framework"). When a page is requested by a browser, the profile is retrieved along with the contents of the page. The browser then checks the encoding (assuming it is XML) looking for directions or alternative style sheets (indicated in a "document profile") for devices fitting the profile (for example in the case of the Palm, to fit a 160 by 160 pixel screen, probably not in color) and customizing the format of the content (reducing graphic sizes or eliminating them, breaking up pages, etc.) for the device. If no such directions are present, then a default format is used.

Much of the interactivity on the Web comes from the use of Web forms and a recently released recommendation that is part of XHTML provides enhanced forms functionality. It is called [Xforms](#) and incorporates into form fields some of the functionality added to forms through JavaScript, for example, the ability to validate a form type (to check to see if a user has typed in a number, for example). One of the goals is to make Web forms device independent so that the enhanced functionality of Xforms will work on any Internet device (such as on hand-held browsers not supporting JavaScript). Of course, the form fields will also be fully scriptable, making on the fly transformation of fields more powerful (see [example](#) of language toggling in pull-down keyword list within a search page). For Web authors familiar with HTML, XHTML will not represent a significant learning curve. Major [differences](#) include a mandatory "doctype" tag, using lower case for all tags, and the insistence on end tags (i.e., line breaks `
` becomes `
`). In most cases, Web page editors will automatically rewrite tags to be compatible with XHTML.

There are several other XML developments of potential interest to language learning educators/developers. [RSS](#) or "Rich Site Summary" allows for development of standardized XML descriptions of Web resources, which then can become content channels, with information provided in standardized ways. This is how [My Netscape](#) is implemented. There are several efforts underway to provide application sharing over the Internet in XML: [RPC](#) ("remote procedure call"), developed by Dave Winer (creator of the Frontier scripting language) and [WDDX](#), or "Web Distributed Data eXchange" by Allaire Corporation. There is considerable interest currently as well in XML-based voice Web browsing. Several companies are gearing up to provide extensive services through a phone interface for retrieving Web pages.

The Holy Grail: Compatibility

What Web developers have been hoping for more than any fancy new features, is a standardized way to develop additional Web-based interactivity, which works across different browsers and operating systems. Currently, there is often not even compatibility among versions of the same browser for different operating systems. Microsoft, for example, has added a number of proprietary [elements](#) to Internet Explorer 5, some of which are Windows only, such as HTA ("HTML Applications") and HTL ("HTML Components"). Web developers have to consider very different browser compatibility as illustrated in resources such as the [browser compatibility chart](#) or user services such as [Bobby](#), an HTML validator which also highlights compatibility issues on Web pages. Browser companies don't make it any easier on developers. Netscape, for example, [no longer supports](#) in Netscape 6 its loudly trumpeted "layer" tag and certain other proprietary tags. This is, of course, a positive development (unless you've made heavy use of the layer tag), since it signals the adoption of a standards approach.

The degree of standards support in Netscape 6 preview and Internet Explorer 5 is much improved over the version 4 browsers. Support is provided in both (although not always complete) for [HTML 4.0](#), [CSS 1](#) (Cascading Style Sheets, level 1) and the [DOM 1](#) (Document Object Model, level 1). One caveat for language use, is the continued lack of support for bi-directional text layout called for in HTML 4.0 and needed for display of Hebrew and Arabic. Support for Internet standards, along with a common set of browser scripting functions (both browsers are moving toward support of [ECMAScript](#) edition 3, the standardized version of JavaScript 1.5) is important in creating universally accessible pages but also is crucial for the further development of "dynamic HTML" (DHTML), the ability to change elements of a page on the fly through client-side scripting. For use in version 4 browsers this kind of interactivity had to be separately coded for Netscape and Internet Explorer browsers. DHTML has become a popular method for creating interactive content for language learning. Tools such as the [Interactive Exercise Makers](#) from Dan Beeby of Swarthmore College or [WebAuthor](#) by Vasu Renganathan of the University of Pennsylvania make use of DHTML to provide browser-based interactivity. The "document object model" upon which DHTML is based is now also accessible from XML, which means even more powerful

dynamic page activity are possible, as illustrated by sample [Mozilla](#) and [Microsoft](#) pages. (Note: these pages are encoded in XML and require use of Internet Explorer 5, Mozilla, or Netscape 6.)

Conclusion: More Services, Fewer Developers?

Language learning developers don't have the leisure to work on technologies which have a short shelf life. Some Web-based technologies have been red hot, only to fade away, as in the case of "push" technologies. "Instant messaging" is hot now, and holds considerable promise for user-to-user contact and communication but suffers from compatibility issues. XML-based applications, on the other hand, seem to be a wise technology to consider, given its current wide support. Of course many new technologies are developed for commercial reasons and are probably of limited interest for language learning, such as "electronic wallets" or yellow-page style "directory services." One exception may be so-called Web "intermediaries." These are programs residing on the Web, similar to proxy servers. They can take content from Web pages and re-format them or adapt them in various ways. [Babelfish](#) (from AltaVista), for example, is such a service which provides on-the-fly translation. Another [possible use](#) is to add annotations to a document residing on another server.

As the Web platform develops greater sophistication and power in its core languages, new opportunities emerge for developers. Another result, however, is that the growing complexity of developing Web resources may exclude many teachers from the chance of participating creatively in Web authoring (rather than just using authoring templates). The danger inherent in this process is to remove those with pedagogical experience one step away from the technology. We need to have teachers directly involved in pushing the boundaries of the technologies in order to help search out new methods to enhance student learning. As yet, there are few resources which make it very inviting to work with XML. [Dreamweaver 3](#) offers some support and there are other commercial products emerging. For now, however, most XML encoding is done by hand or with Unix-based tools. We can only hope for good, easy-to-use authoring tools for XML which will bring this powerful new technology within reach of language teachers. Several such projects are underway from language professionals. Henry Thompson (of the Language Technology Group of the University of Edinburgh) is developing [XML Tools](#) and has several [XML tutorials](#) available. Robert Bigler (of the Institute for Advanced Technology in the Humanities of the University of Virginia) is developing [iBabble](#), an XML text tool using Unicode and capable of displaying multiple texts in parallel windows.

Resource List

Browser Information

[What's New in Internet Explorer 5](#) From Microsoft
[Document Object Model Overview](#) From Microsoft
[IE5 Sample pages](#) From Microsoft, illustrating new features of Internet Explorer 5
[Mozilla](#) Open source browser development project spearheaded by Netscape
[Gecko Layout Engine](#) Information about Mozilla's new browser engine
[Netscape 6](#) Preview Release information and download
[Netscape 6 FAQ](#) Information about what's new in Netscape 6
[Web Clipping Development](#) Info from Palm Computing about developing Web clippings for Palm use
[Windows CE browsers](#) From cnet
[Palm browsers](#) From cnet
[Rebel Browsers](#) Alternatives to Netscape or Microsoft's browsers (from cnet)
[Opera](#) Home of the alternative browser
[Review of Opera](#) From cnet
[Icab](#) Alternative browser for the MacOS

Varieties of XML

[HTML - The Next Generation](#) From Zdnet Developer

[How XHTML Will Reduce Your Coding Tasks Today](#) From Zdnet Developer

[XHTML protocol gets thumbs up from Net group](#) From cnet news

[XHTML.ORG](#) News about XHTML

[XML Tools](#) From Henry Thompson (University of Edinburgh)

[XML Tutorials](#) From Henry Thompson (University of Edinburgh)

[NGLayout and XML](#) XML Examples From Mozilla

[Matt Neuburg Explains XML RPC](#) Information about "Remote Procedure Call," an application sharing technology using XML

[WDDX Home Page](#) for "Web Distributed Data eXchange," an XML-based application and data sharing system

[Extensible User Interface Language](#) Information and Links about XUL (interface builder from Mozilla)

[RSS Delivers the XML Promise](#) Information about "Rich Site Summary," XML-based site sharing facility

[Quickstart Guide for My Netscape Network](#) Information on creating a "channel" using RSS

Internet Standards and Compatibility

[The Cross-platform Browser Blues](#)

[Figuring Out Browser Compatibility](#) From Webreview

[Browser Comptability Chart](#) From Webreview

[Browser Compatibility](#) Comparison of support for style sheets in browsers (from Style Master)

[Transitioning from Proprietary DOMs and Markup to W3C Standards](#) Use of layer and other proprietary tags

[Netscape Standards Challenge](#) Comparison (from Netscape) of IE5 and NS6 support of Internet standards

[A Reply to Readers' Concerns about Standards Compliance in Internet Explorer 5.5](#) From Microsoft

[Bobby](#) HTML validator and accessibility checker

[Browser Stats](#)

[Xforms Home Page](#) From W3 Corporation

[Document Object Model](#) From W3 Corporation

[Style Sheets](#) From W3 Corporation

[Mobile Access](#) From W3 Corporation

[Television and the Web](#) From W3 Corporation

[Synchronized Multimedia: SMIL](#) From W3 Corporation

[Voice Browser](#) From W3 Corporation

[CC/PP Reading Materials](#) From W3 Corporation

[ECMA-262](#) Specification for ECMAScript, the standardized version of JavaScript

[WML](#) Brief discription of "Wireless markup Language"

Language Learning and Internationlization

[Dynamically Manipulating HTML Elements With Dom Level 1](#) From Mozilla

[iBabble](#) Unicode XML Browser (from Robert Bingler of the University of Virginia)

[Unicode and the Web](#)

[What is XML and Why Should Humanists Care?](#) From C.M. Sperberg-McQueen (one of the architects of XML)

[Interactive Exercise Makers](#) From Dan Beeby (Swarthmore College)

[WebAuthor](#) From Vasu Renganathan (University of Pennsylvania)

[Internationalization](#) From W3 Corporation

[Unicode in XML and other Markup Languages](#) From W3 Corporation

[Weaving the Multilingual Web: Standards and their Implementations](#) Tutorial/Presentation