

ACCESSIBILITY OF ONLINE SYNCHRONOUS LEARNING SPACE: CHALLENGES AND STRATEGIES

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ABSTRACT

This document provides an overview of the accessibility challenges of web conferencing technologies used to create online synchronous learning space and a discussion of guidelines and strategies needed to accommodate students with a disability in this environment. It includes some information from the UNC system's evaluation of four synchronous learning management (SLMS) solutions.

INTRODUCTION

Over the last few years, the explosion of Web-enabled communication, collaboration and presentation technologies has enhanced the ability to integrate different teaching and learning styles within online learning environment. In addition to the familiar asynchronous "anytime" web resources, synchronous interactive technologies now make it possible to emulate traditional brick and mortar classroom experiences.

Web conferencing technologies are integrated applications that combine facilities for presentation, collaboration and communication, making it easier and more affordable to use them to provide a synchronous online learning space. While products differentiate in the feature sets, these technologies generally encompass tools for:

Communication

- Audio conferencing using VoIP
- Real-time text chat or instant messaging
- Video conferencing
- Presenter and participant signaling and moderation controls

Collaboration

- Whiteboards
- Annotations
- Application Sharing
- Desktop Sharing
- Co-browsing
- Remote keyboard and mouse access

Presentation

- Information viewing (PowerPoint, documents and applications)

File Sharing

- Real time upload and download

Response

- Survey and polling tools

Session Recording

- Sessions can be recorded for future publishing

The UNC system is considering Web conferencing applications to provide instructor-led, synchronous online learning spaces. In the fall of 2005, a task force was assembled to evaluate The Web conferencing applications Centra Symposium, Elluminate, Horizon Wimba and Macromedia Breeze.

In order to develop a prioritized accessibility check list to evaluate the different products, it was important to understand the accessibility challenges and identify accommodation strategies in this space.

ACCESSIBILITY CHALLENGES WITH SYNCHRONOUS SYSTEMS

The current state of web conferencing technology presents accessibility challenges for a range of people with disabilities. Since they emulate and combine tools and strategies used in brick and mortar classrooms with tools available for online instruction, these systems often compound accessibility challenges that are inherent in both environments. For a learning environment to be accessible to persons with disabilities, the workspace, navigation, interaction and content must all be accessible.

Workspace

- **User Interface.** Web conferencing applications typically install a client on the users' computer that functions as the user interface (UI) to the application tool set. The UI is divided into multiple windows called panels, modules, or pods. Each window is designated for a specific service or feature, including content presentation. Depending on how they are developed, the UI itself can be inaccessible to screen readers. This environment demands user attention to multiple areas, which can be limiting for people with cognitive disabilities who have trouble simultaneously focusing and tracking multiple activities.
- **Navigation.** Web conferencing tools use a multitude of mouse-driven activities to perform most of the tasks user needed to participate in this environment. Many applications do not offer keyboard navigation to various windows, making them inaccessible to people who are unable to use a mouse.

Communication

- **Audio.** Without assistive technology or other support, this is inherently inaccessible for people with hearing impairments. Online verbal communication may also be a barrier for those who talk slowly or use an assistive device for communication.
- **Synchronous Text Chat.** While text-based, both the content display and edit field need to be accessible to screen readers. These are often proprietary Java Applets and may not be designed for keyboard access, or even have the display accessible to screen readers, limiting text-communication by the blind, as well as slow communicators.
- **Video.** Like audio for the hearing impaired, video is inherently inaccessible to screen readers, and thus to the visual impaired, without thoughtful design and technology in place to support blind and visually impaired users.

Collaboration

- **Desktop, application and web sharing.** This includes both remote desktop viewing and sharing. Screen sharing, where the host computer's display is dynamically mirrored on the remote clients, is a common tool. Effectively a shared screen is a captured and compressed image of the host system's display that is being pushed to client machines and is thus inherently inaccessible to screen readers.
- **Application and desktop sharing.** Remote desktop control involves keyboard and mouse events being transmitted, allowing the host or client to control applications. Since local keyboard and mouse events are passed to the remote computer, these can be configured to work with keyboard and mouse accessibility features and with most alternative input devices used by people with motor impairments. Speech recognition, however, still presents problems, since voiced keystrokes need to be processed on the local machine before being transmitted.
- **Interactive Whiteboards.** Electronic whiteboards are synchronous collaboration tools that are fundamental to this environment. They are used for real-time drawing/writing activities and include functionality to import and display graphic files. The whiteboard is

- essentially a graphics application and inherently inaccessible to screen readers. In addition, raster-based images can conflict with screen magnification assistive technologies, causing the information to degrade or disappear with frame changes or screen refresh. Annotation tools are often exclusively involving mouse-driven activities which exclude people who cannot use a mouse.
- **Co-browsing.** Collaborative or synchronized browsing allows participants and presenters to view Web content using the browser on their system.

Content

- **Collaboration tools.** These are used to share and present content. These include all the accessibility challenges that are inherent with these tools used in a non-virtual setting. Text and other content created on whiteboards are simply graphic images.
- **PowerPoint Presentations.** Typically converted into graphic images and displayed on the whiteboards, obviously presenting accessibility challenges.
- **Chat tools.** Real-time text chat tools can create a threaded conversation. When there are multiple participants, the conversation can be fast paced and disjointed, becoming a challenge for people with processing deficits or slow communicators, thereby limiting their participation.

ACCOMMODATION STRATEGIES

Over the years, strategies have been identified and used to accommodate functional limitations of hearing and visually impaired students in brick and mortar classrooms. Synchronous learning space combines all the audiovisual demands of a face-to-face classroom with the added accessibility challenges of information technology resources and delivery systems. In order to facilitate participation of these students in this new learning space, it is important to develop guidelines and accommodation strategies to meet the limitations and demands of this new environment.

- **All Disabilities (Physical, Sensory or Learning Disabilities).** Moderated or limited use of chat and other interactive collaboration tools. Allow time for input from people using assistive technologies. Post-class publication of recorded sessions with attached descriptions, transcription and chat logs.
- **Learning Disabilities.** Limit the use to chat tools for pushing transcripts, text descriptions or content other than the chat thread. Chat room threads can be very confusing for people with processing deficits without adding other content.
- **Hearing Impairment.** Provide alternate access to audio content. At this time, real-time captioning of all verbal communication and audio content is the only viable option. The intermittent quality of live video feeds from within the application precludes the use of real-time sign language interpretation. This is an area evolving rapidly.
- **Vision Impairment.** Use of co-browsing combined with accessible content is a viable modality for presentation. Pre-class distribution of a classroom and whiteboard presentations in an accessible format to facilitate access to content is essential. If possible, provide links to Web content to be used during web-sharing. Provide real-time access to applications and data files used during application sharing. Provide post-class or real-time textual/audio description of all session based visual activities (Whiteboard drawings, annotations and application interactions).

BEYOND EVALUATION: THE NEXT STEP

Synchronous online learning space is a different paradigm, leveraging technology-based communication, collaboration and presentation tools to emulate the instructor-led classroom experience. Without the physical presence, pedagogy and teaching and learning modalities have to be adjusted. In addition, the individual is isolated without the physical presence of another person to accommodate for the individual audio, visual and physical limitations.

The next to step to accessibility is to research, evaluate and test emerging technology that can be integrated and leveraged to provide real-time or alternative access especially for students with hearing and vision impairment. Some of the options we are exploring include:

- Remote signing for live presentations. They normally use ISDN-based remote conferencing systems. The goal is to evaluate using streaming video to provide similar services on the web.
- Digitized pens, annotation tools and handwriting recognition technology to capture and convert graphic text into electronic text.
- Audio output of SVG based whiteboard and drawing surfaces.
- Remote access to computer systems for application sharing.
- Co-browsing for delivery of presentation, documents and web-application sharing.

USE CASES

Developing use cases allowed us to evaluate evenly across applications. Bob King from the University of North Carolina at Greensboro developed several scenarios that were used for testing across systems.

These are examples for the use of audio:

Scenario One

An instructor who has been using the text chat feature of their standard LMS to conduct synchronous class meetings online is interested in substituting audio chat for the text chat. In the audio chat meetings, this instructor just wants to be able to show PowerPoint slides as a way to prompt class discussion, and use polling (including the ability for students to respond with short-answers) on key points/questions. S/he would like the set-up of the audio meeting room to be as easy, or nearly as easy, as setting up a chat session in the LMS system. Indeed, keeping it simple (for students and teacher) is high on this instructor's list of priorities.

Scenario Two

An instructor wants to use synchronous audio to conduct and formal debate competitions among students. S/he wants to be able to easily switch between highly controlled access to the mike during the formal parts of the debates, to an 'open mike' set up for the debriefing sessions that follow the formal aspects (part of this instructor's research involves how 'turn taking' evolves online in an open aural environment without visual cues --so s/he would like, if possible, to have the open part of the audio sessions function like a conference call, w/o need to push a 'talk' button or etc). This instructor would only post a couple of visuals, just to announce the beginnings and ends of the formal parts of the debates and the informal/debriefing parts of the sessions.

THE RUBRIC

We looked at the four synchronous applications that the UNC system chose to evaluate and tried to develop a set of questions that would highlight accessibility concerns, strengths, and overall philosophy. User control of the interface was something we looked at throughout the evaluation, with a sharp eye for input device specific elements. We developed a long list of features we would evaluate.

The login screen, a point of entry for the entire application, must obviously be accessible and easy to use. We chose input-device independence as the key feature to check.

Within the application workspace, input-device independence remains central. This space is rich in features, and there were a number of points we felt were essential to look at. These included navigation and reading order, the presence and functionality of a text chat option, and user interface element representation for screen readers.

One of the most difficult features to make accessible in a synchronous environment is a whiteboard, a feature that all four applications offer in either SVG or raster-based versions. We chose to note the technology employed, because XML-based SVG shows a lot of potential from an accessibility standpoint. Keyboard annotation tools were also examined.

Does the application provide keyboard access to application sharing? Again, input-device independence was a central criteria.

Support for closed captioning was examined. Did the application provide a separate window for closed caption information? Could it be streamed in the chat window? We viewed the latter possibility as a sound interface choice.

How the applications accommodate and support other accessible tools was an important part of the rubric. We looked at how well they supported and interoperated with external user agents. More simply, did the applications provide space for the text description of graphic content?

Finally, there were other important questions we asked: Was session capture an option, and if so, in what format was the data retained? Were text messages public, private, or configurable? How was file upload and download handled, and how usable was this feature?

ACCESSIBILITY CHECK LIST FOR WEB CONFERENCING TOOLS

Login Screen

Keyboard access to login fields
Access to the dialog box

Workspace

Access to UI to screen readers including menus, emoticons etc
Navigation between modules
Keyboard access to each modules
Keyboard access to annotation tools
Toggle microphone (sticky key) lock to talk
Text Chat
Keyboard access to the tool
Keyboard access to edit, display field
Reading order of display screen

Whiteboard

SVG or raster based?
Keyboard Annotation tools

Application Sharing

Keyboard access to application share

Support for Closed Captioning

Separate window?
Streamed in the chat tool?

Support for other accessible tools

Support external user agents
Space for text description of graphic content

Session capture

Text messages private or public or user preference
User control on session capture

File upload/download

Usability and feature set?

SOME NOTES FROM THE UNC SLMS TASK FORCE FINAL REPORT

(Adapted from the report prepared by Andrea Eastman-Mullins)

Centra Symposium 7.5

- Centra allows up to four attendees to use the microphone and video at the same time.
- Text chat is undocked from the rest of the interface requiring a student or instructor to manually open it during a session.
- The text chat is also not recorded in a session archive, although the chat log can be downloaded separately.

Illuminate Academic version 6.5

- To show a PowerPoint presentation outside of application sharing, a user must convert slides to whiteboard files in Illuminate. This process rendered slides to be of much lower image quality than the original PowerPoint slides. Additionally pasting text into the whiteboard is cumbersome, because the text will not automatically wrap.

Horizon Wimba Live Classroom 4.2

- Immature feature set and lack of interaction tools.
- Students are not easily able to give visual feedback during a session.
- The whiteboard is not object-oriented, which means that objects cannot be rearranged on the whiteboard after placement.

Macromedia Breeze Meeting version 5

(Note that the Task Force did not include the separate product Breeze Presenter, a narrated PowerPoint application, in its review.)

- Built on proprietary technology from stem to stern. This is both good and bad, since Flash has a huge installed base but prevents customization and control by both the institution and end user.
- Highly customizable interface is a grey area - potentially good for cognitive disabilities while presenting serious problems for visual disabilities.
- By default, anyone with microphone privileges is locked on with hands free audio. Audio quality in evaluation was erratic and of a generally poor quality. Instructors must manually adjust students' permissions enable speaking and editing of pods.

ACCESSIBILITY NOTES FROM THE SLMS EVALUATION

The SLMS model requires computer interaction and is highly audio/video driven. In order to be accessible, the product design should address the functional limitations of users with visual, hearing, mobility and speech and integrate with assistive technology like screen readers.

While none of the products meet all our criteria, we both agreed that Elluminate was the best of the four systems from the perspective of people with disabilities as it is the most functionally accessible of the four SLMS we evaluated.

The main reason is that the product is Java-based and it allows a Web-based lingua franca that is easily parsed by assistive technology and built-in MSAAs. This allows developers to address current and future accessibility needs. The user interface of the current version is primarily accessible to screen readers. Other features include keyboard access to each module and keyboard access for application sharing; an object-oriented whiteboard that does not degrade on magnification; ability for users to easily set their preference for color and layout; closed captioning with support for and multiple caption streams.

FINAL RECOMMENDATION

No SLMS reviewed emerged as a perfect fit for UNC's needs. This was doubly true from an accessibility perspective. The final report's recommendation reads:

"Because Elluminate offers cross-platform support, scores highest on accessibility features, and integrates better than Centra with both Blackboard and WebCT, we recommend Elluminate for system-wide deployment at this time."