

Development and Delivery of an Interactive Web-Based Seminar

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Introduction

As technology improves our ability to exchange information, the goals of information exchange become more complex. Traditional means of transferring information, such as a conference or a journal article, may not be sufficient under some conditions. An audience may be spread over the globe, the information may not present well in a written format, more time may be needed than is allowed at a conference, there may be requirements to archive data so it can be viewed at a later date. These problems can be solved using the internet as an information transfer medium. A web seminar with live streaming audio satisfies these goals and can be implemented with minimal cost and effort.

In the past year, we developed and delivered a web-based seminar from the University of Missouri-Rolla to help disseminate material we created as part of an NSF-CCLI grant. As few ready-made, affordable options existed for delivering a web seminar at that time, we explored several methods of developing and delivering the seminar ourselves.

Goals and Requirements

We began developing our seminar by setting several general requirements for the seminar. The seminar must be delivered in real time, it must reach a wide audience, it must be archivable, and it must be delivered with tools that allow questions to be asked and answered in real-time. Requirements for real time transmission included audio and visual components. Reaching a wide audience involved several factors. To include participants in many time zones, the seminar time must be chosen to make sure most people could log on at a reasonable (local) time. The hardware and software necessary to receive the seminar must be easily available to as many people as possible. The seminar should be able to be viewed on different operating systems, using relatively slow connection and processor speeds, and the required software should be available virtually for free to all potential participants. The seminar should also be able to be archived, so that those who could not participate could download the information at a later date. The archive should include the question/answer forum as well as the audio and visual components, so that users could view the seminar almost as though they were participating in the actual event.

Based on these requirements, a detailed set of goals was developed as depicted in Table 1. These goals were assigned a high, medium or low priority. Most of these goals are relatively self-explanatory. With respect to real-time audio, however, our goal was only to supply real-time audio from the speaker to the audience, not from the audience to the speaker or between

audience members. In a moderately sized seminar, it is very easy for audio participation by the audience to quickly lead to confusion: audience members may interrupt the speaker to ask questions; it may be difficult to determine who is speaking at any one time, the presenter or one of several participants; office noises may filter in through the audience's audio connections and make it difficult for others to hear; the time-lag over the internet makes for awkward pauses between verbal questions and answers. In our opinion, the audience should only be able to communicate with one another or with the speaker in written form. The speaker may then monitor written questions and answer them verbally if they wish.

High Priority	Medium Priority	Low Priority
1. Real-time audio	1. Scratchpad/digital whiteboard	1. Ability to write on and point to slides
2. Slide visual aides	2. Chat window-question/answer forum	2. Slide animation
3. Widely available software tools	3. Slide tracking number or speaker control of slides	3. Real-time screen capture
4. Software compatibility with multiple operating systems	4. Easy to create	
5. Simple to use software	5. Scratchpad and chat window archived	
6. Adequate reception at 56 kbps	6. Small archive file for use on web	
7. 30 user minimum		
8. Archivable		
9. 40-60 min. presentation		

Table 1: Goals and priorities for the web seminar.

Once goals were set, methods of broadcasting the seminar were explored. Broadcast options were compared to the goals to determine which would best satisfy the needs of the seminar. Four broadcast options were investigated in depth: Blackboard, RealMedia, Windows Media, Microsoft NetMeeting, and RealPresenter.

Blackboard is an effective tool for web-based delivery of course material. The material is delivered through Netscape or Internet Explorer using the "virtual classroom" applet. Since the user only needs access to Netscape or Internet Explorer, any potential seminar participants could access our seminar through this tool. While Blackboard has a great deal of features for delivering course materials, features of interest to a web seminar include:

- Slides viewed by the audience are under the speaker's control.
- Slides are stored in html format.

- Slides may be written on to illustrate or emphasize a point.
- Names of participants may be viewed in the instructor's window.
- A question and answer forum is available that allows "students" to privately ask the instructor questions and the instructor to answer that student. Question and answer sessions may be archived.
- A group discussion forum is available that allows participants to communicate with one another.

Some disadvantages of the Blackboard software are that participants must be provided with a login and password and that a special procedure is required to load slides prior to presentation, unless the html file contains navigation. An advantage of a login, however, is that the presenters may track who participates in their seminar. Blackboard does not provide support for real-time audio, so must be used with a streaming audio tool such as the RealMedia or Windows Media software. Blackboard is an excellent tool when available. A 1st level university license (as we had access to) can be purchased for a yearly fee of \$7500. On the other hand, Blackboard is delivered entirely through the web, so participants may use it at no cost since they only have to have access to a web browser.

RealMedia is a group of software packages for web-based media encoding and playback. The media can be live or archived and can include audio or video files. Our seminar utilized the audio broadcast capabilities. The live seminar is broadcast through a server and encoder combination and received by a participant using the player. The server software is Realserver. The encoding software is RealProducer. Options for the broadcast and other features include:

- Two options for RealServer software depending on the number of participants.
 - RealServer Basic is free and has a 25-user limit.
 - RealServer Pro costs \$1670 and has a 60-user limit.
- Encoding software is RealProducer Plus
 - It has 20 kbps mono live stream capability.
 - It is archivable.
- The media player is RealPlayer which the participant can download free of charge at <http://www.real.com/player>.
- RealMedia software is available for Windows, Macintosh, and Unix operating systems.

Windows Media Technologies is similar to RealMedia except it was designed for the Windows operating system only. The Windows Server is optional, however, as a single software package can both encode and serve the audio stream. The broadcast may be done from the encoding machine with a 50-user limit. Features of Windows Media Technologies include:

- Windows Media Server can be used as the broadcasting software with no user limit.
- The encoder is Windows Media Encoder.
 - It has a 50-user limit when used as the broadcasting machine.
 - It has 6.5 kbps and 20 kbps mono voice stream capabilities.
 - It is archivable.
- The media player is Windows Media Player, which the participant can download from <http://www.microsoft.com>.
 - It is standard on Windows 98+
 - It is a free download for Windows 95 users

- The Windows Media Technologies software is only available for the Windows operating system.

Microsoft NetMeeting contains features for both the slide presentation and the audio stream. Options include:

- Support of real time audio through voice conferencing
- A scratchpad and chat window that are archivable.
- No user limit.
- Audio stream up to 56 kbps.
- Present on Windows 98+ and free for download for Windows 95 users.
- Available only for Windows operating systems.

There are a few disadvantages to this broadcast option. Participants must download slides prior to the seminar and then the presenter must give clear audio cues to help the participants synchronize the slide they are viewing with the presentation. It is possible to allow users to view windows on the presenter's machine, thus allowing the presenter to change slides for the users, but window-update times are very slow in this case, particularly for users dialed into the internet through a modem connection. Another disadvantage is that the presenter does not have the ability to prevent others from talking during the meeting. If the participants forget to turn off the microphone at their machine, then their microphone will broadcast any sounds it picks up to the entire audience. These extra sounds can be distracting and prevent good seminar delivery. A minor disadvantage is that while the chat window can be archived, the voice stream cannot. The most important disadvantage is that Microsoft NetMeeting will only reach users who use Windows. If Microsoft NetMeeting were used to broadcast the seminar, Macintosh and Unix users would not be able to participate.

RealPresenter captures audio and slides from PowerPoint. The presenter controls the slide presentation and the participant views everything through RealPlayer. Features include:

- Capture of audio and slides from PowerPoint.
- Two options depending on user limit.
 - Basic (free-15 user limit)
 - Pro (\$199.95-25 user limit)
- Data stream can be sent via RealServerPro to reach an unlimited number of users.
- Works with 56 kbps modems.
- Archivable.
- The media player is RealPlayer which participants may download at <http://www.real.com/player>.
- No scratchpad or chat feature.

RealPresenter does not include any feedback features such as a chat window, which is a disadvantage. There is also a 25-user limit unless the RealServer is used.

The following combinations were considered because they satisfied most of the priorities set out for the seminar:

- Blackboard and RealMedia
- Blackboard and Windows Media Technologies
- Microsoft NetMeeting
- RealPresenter and Blackboard.

Blackboard must be combined with either RealMedia or Windows Media Technologies to serve real-time audio. RealPresenter and Blackboard were combined to provide a question and answer or chat window.

These combinations are compared in Table 2, which summarizes the priorities from Table 1 that each combination meets.

Priorities	High									Medium						Low			Cost
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	1	2	3	
Blackboard Real Media	X	X	X	X	X	X		X	X	X	X	X	/		X	X	X		Blackboard free(if available) Realserver Basic free(25 user) Realserver Pro \$1670(60 user)
Blackboard Media Technologies	X	X	X		X	X	X	X	X	X	X	X	/		X	X	X		Blackboard free(if available) Media Technologies free(50 user)
Microsoft Netmeeting	X	X	X		X	X	X	/	X	X	X		X	X	X				Netmeeting free download
Blackboard Real Presenter	X	X	X	X	X	X		X	X	X	X		/	X					Blackboard free(if available) RealPresenter Basic free(15 user) RealPresenter Pro \$200(25 user)

Table 2: Comparison of software combinations with priorities delineated in Table 1.

While Microsoft NetMeeting is a good choice because it is freely available on all Windows 98+ platforms and has several of the features necessary to serve a web seminar, it is platform specific and cannot be run on Macintosh or Unix machines. A better solution is to use Blackboard with RealMedia or Windows Media Technology. We chose to use both RealMedia and Windows Media to maximize the number of potential users we could reach. Blackboard and RealMedia run on Windows, Unix, and Macintosh machines. Windows Media is standard on most Windows platforms, eliminating the possible need for Windows users to download and install any software.

Implementation

Implementation of a web seminar requires considerable planning and preparation, as depicted in the suggested seminar timeline shown in Figure 1. Time must be set aside to advertise the seminar, to register participants, to provide participants with instructions on how to attend the seminar, to prepare slides, to rehearse for the seminar, and finally to conduct the seminar itself. If possible, first time presenters should begin planning even earlier than shown in Figure 1 to allow time for software training.

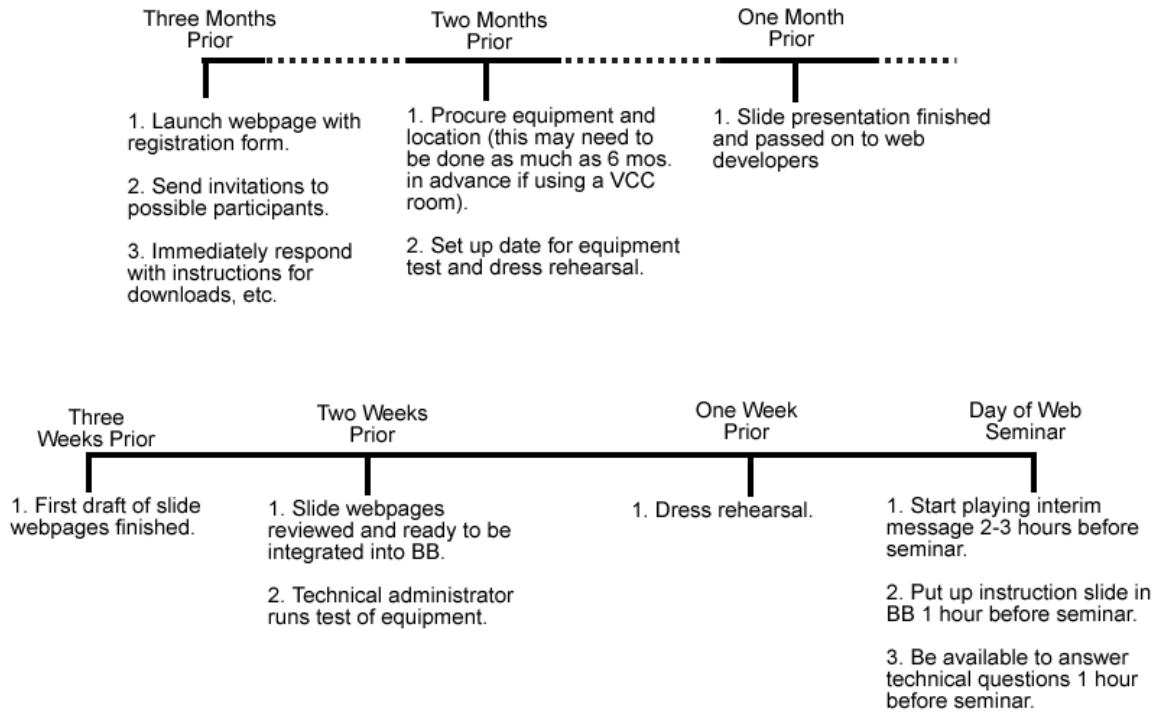


Figure 1: Suggested development timeline for a web seminar.

There are many options available for advertising a seminar, depending on the funding available for the project. Announcements can be made for free at conferences and meetings or through list-serves (i.e. newsgroups) that serve relevant areas if interest. On occasion, there are various web pages that may advertise your seminar for you. Advertisements can also be purchased in trade magazines or conference bulletins. If funding is high enough, lists of names and addresses may be purchased from trade magazines, conferences, and professional organizations such as IEEE, and potential participants may be mailed directly. Direct mailing can be quite expensive – up to \$1 per person – depending on the quality of the brochure that is sent. It is worthwhile to advertise to as many people as possible. The ratio of people to whom you send an advertisement to the number who attend the seminar may be as little as 100:1.

Participants may be registered for the seminar in several different ways. We used an online registration form for our seminar, where registration was performed automatically once the participant filled out the required form. However, one could also have participants fill out a downloadable form and fax or mail it back. An online form is preferable because there is immediate confirmation of enrollment for both the web-seminar administrators and the participant. The registration form should be as simple as possible. One may minimize confusion by doing such things as making sure that form objects are wide enough to encompass all necessary information, by splitting a phone number into 3 separate form objects, or by putting an @ sign between two form objects to indicate an email address.

Once a participant has registered for the seminar, they should be sent a set of instructions that tells them where to download any software that is needed, how to use the software, and any other necessary information. The instruction sheet should be clear and concise. It is worthwhile to send the participant the seminar instructions early, perhaps when sending them their registration confirmation. It is also worthwhile to send them a link to an online version a week before the seminar takes place. As with the registration form, the instruction sheet should be as simple as possible. The easier it is to understand, the fewer hardware and/or software problems that you will have to help participants fix. Regardless of how simple the instructions are, be prepared to answer questions the day of the seminar.

Having a complete rehearsal before the seminar is necessary – especially if you are unfamiliar with the software. The rehearsal consists of two parts: an administrative test of software and equipment, and a full “dress” rehearsal. In the administrator’s rehearsal, a mini seminar should be broadcast using all the equipment used in the actual seminar and should be monitored from all possible types of workstations used by the participants. If a browser window is necessary, check both Internet Explorer and Netscape. Monitor the mini-seminar from Unix, Windows and Macintosh platforms. Ideally, the administrator’s rehearsal is done very early, even before instructions are sent to participants. Conducting this rehearsal early is especially important for first time administrators.

In the dress rehearsal, all administrators, presenters, and seminar-monitors should be present (a monitor is a person who monitors the seminar like a participant and who quickly reports any problems to the local seminar administrator). The seminar should be conducted as though it were being broadcast to a “live” audience. Use the same equipment that will be used the day of the seminar. Test all features of the software that will be used and ensure the presenters are comfortable using them. The dress rehearsal may easily take twice as long as the actual seminar.

Staff

Four or more people are needed to put on a web seminar: two presenters, one presentation monitor, and one system administrator. Two presenters are necessary even if only one person actually speaks during the seminar. The delivery of audio over the internet can be accompanied with a considerable lag between when the presenter speaks and when the audience hears what the presenter said. This lag may differ between RealAudio and Windows Media software. There is also a lag between when the presenter changes slides and when the audience sees that change. This lag is often different from the lag for audio information. It is very difficult for a single presenter to speak and simultaneously monitor audio and visual delivery so that he can ensure that slides are changed at the right time to keep the two in sync. In fact, it is difficult for a presenter to simply speak while listening to his own voice delayed by several seconds. Two presenters should be used so that one presenter may listen and change the slides according to the audio delay while the other speaks. It is better if the speaker does not listen to the audio stream during the presentation at all. Another job for the second presenter is to monitor questions. When an appropriate question arrives, the second presenter may answer the question directly via email or may interrupt the speaker, verbally pose the question, and allow the speaker to answer it. This interruption by a second presenter gives the audience a clear delineation between the

formal presentation and questions asked by the audience. A presentation monitor may take over some of the responsibilities of the second presenter if needed and if the monitor has the experience necessary to answer and choose questions.

The presentation monitor participates in the seminar in much the same way as the audience, listening to the audio feed and watching the slide presentation. If a problem occurs with seminar delivery – for example, if the audio feed is interrupted – they can immediately alert the system administrator to fix the problem and possibly alert the presenter so the seminar can be paused. Ideally, there should be a presentation monitor for each audio feed. In our case, one monitor for RealMedia and one for Windows Media, though one presentation monitor may also switch back and forth between audio delivery platforms. This task may also be taken care of by the second presenter, if they are not answering questions. At our seminar, a presentation monitor was invaluable when the audio stream was interrupted unexpectedly in the middle of the seminar. We would never have known without the monitor.

The system administrator monitors the audio encoding computers, audio equipment and audio-stream server; fixes problems with these systems; and gives phone support to audience members. Phone support is necessary to help audience members work through last-minute problems. Having phone support in the same room as the speaker can be a problem, because the administrator's voice can easily be picked up and broadcast to the entire audience during the presentation. We suggest using a portable phone that has a silent ring indicator. The administrator should also be able to exit the room quietly to speak on the phone. However, the administrator should also be easily accessible to the speakers and presentation monitor(s) in case a problem occurs.

Hardware

A web-seminar using Blackboard, RealMedia, and Windows Media requires: a computer to act as a server for RealAudio and Windows Media (i.e. to run RealServer and Windows Media Server, respectively), a computer to encode RealAudio information, a computer to encode Windows Media information, a computer for each local "client" (i.e. speakers, monitor(s), and administrator), and requires audio recording equipment. Minimum specifications for these components are discussed in the following paragraphs.

The server, which does the actual broadcasting of the seminar audio stream, must conform to both RealServer G2 and Windows Media Server requirements. RealServer G2 requires approximately 6 MB of RAM plus 40 K for each simultaneous audio stream. A 120 MHz Pentium class computer can sustain 100 users using less than 30% of its CPU cycles. Windows Media Server requires at least a 90 MHz Pentium class computer with 64 MB of RAM and 21 MB of available storage space to store the program.

The computers encoding the audio information record the audio inputs from the speaker, encode these inputs as streaming audio, and archive the result. One computer is required for each audio stream - in our case, one for RealAudio and one for Windows Media – unless a fast machine is used and two sound cards are present. These computers must conform to the requirements of RealProducer Plus G2 and Windows Media Encoder 7. RealProducer Plus G2

broadcasting a single rate stream requires a 166 MHz Pentium, 32MB of RAM, a 16-bit color display, 1 GB of hard drive space, and a 16-bit Windows compatible sound card. Windows Media Encoder 7 requires a 200 MHz Pentium with MMX, 32 MB of RAM, Win98+, and a supported audio capture device. Adequate storage is needed to archive the recorded audio information. With care, each encoder can be set to produce the same audio delay between the speaker and the audience by tweaking their respective baud rates.

The client computers must be able to receive the streamed audio and run the Blackboard software from Netscape or Windows Internet Explorer. Either RealPlayer or Windows Media Player 7 can be used to receive audio. RealPlayer is available for Windows, Unix, and Macintosh operating systems. Under Windows, a 120 MHz Pentium class computer with 16 MB of RAM, a Windows compatible 16-bit sound card, 16-bit video display, and a 28.8 kbps or faster Internet connection is required. The Macintosh requirements include Mac OS 8.1 or later, 32 MB of RAM, virtual memory set to 64 MB, a 604 PowerPC (200 MHz or faster), and a 28.8 kbps or faster Internet connection. Windows Media Player 7 requires a Windows based operating system with a 166 MHz Pentium class computer with 32 MB of RAM, a 28.8 kbps internet connection, a Windows compatible 16-bit sound card, and a 256 color video card.

A wide variety of audio equipment will meet the needs of a web seminar. We chose to use a standard wireless microphone and a mixer. The mixer had 2 outputs, with one output fed to each encoding machine. Since our seminar had two speakers and only one microphone, the presenters handed it back and forth. Higher quality audio equipment is useful for reducing random and background noise in the broadcast stream.

Room

The important things to consider when choosing a room are the relative locations of computers and the sounds in the room that may interfere with the broadcast. The presenters should be in close proximity, so they can easily communicate and/or hand off the microphone. The administrative support should be as far away from the microphone as possible because they must provide telephone support, which causes excessive background noise. Ideally, the administrative support and the presentation monitor should be in a separate room from the presenters while still easily accessible. They should be able to see the presenters and to communicate with them if necessary. Any background noise should be eliminated. Background noise can be distracting in the best of recordings, but is particularly annoying in the low-quality audio delivery that is often available at low bandwidths across the internet. The room should allow as little outside noise as possible and should have minimal echo. Carpeted floors and thick walls will help as will high-quality audio equipment.

Slides and audio

Blackboard displays slides in html format. Any slides presented using Blackboard must be saved in html. We created slides first using PowerPoint and then converted them to html one slide at a time. There is an option in PowerPoint to convert slides directly to web files, but this is not advisable. It will create web pages with frames that are not easily viewed in Blackboard's Virtual Classroom. The best option is to save the presentation as a series of images (.jpeg files)

and then create a web page for each slide. An advantage of this technique is that the images may be optimally sized to fit the audience's screen. If the image is too big, audience members will have to scroll back and forth to see the entire slide, an obvious distraction.

Slides can also be loaded into Blackboard's Virtual Classroom the day of the seminar, but this process is time consuming and the slide format is not archived when the applet window is closed. It is better to create a set of linked web pages that is accessible through Blackboard. To provide access to the entire list of slides, forward and back navigation icons should be included on each web page. A link to another web page with a full list of slides can be helpful if a question requires the use of a slide from somewhere else in the talk.

In addition to the standard presentation slides, we found it useful to have additional slides and audio ready for special circumstances. An instruction slide was displayed an hour before the seminar for those checking their connection. This slide was the "first" slide of the presentation. It contained contact information, instructions for troubleshooting an audio feed, and the seminar's start time. When a participant logged into the seminar and saw this first slide, they would also hear a repeating sound clip of instructions that allowed them to check their audio connection. The speaker's voice automatically replaced the sound clip once the seminar started. A "Technical Difficulties" slide can be very useful if there is an interruption in the audio feed. Under Blackboard, additional blank slides that can be used as scratchpads to answer questions may also be useful, since Blackboard allows you to write on individual slides and save what you have written for later viewing.

Archiving

Blackboard does not have an option to archive an entire seminar (both audio and visual portions) as a whole, so each component must be archived separately and brought together later. The audio stream may be recorded automatically by the encoding software and archived as either a Windows media file (file.wma) or RealMedia file (file.rm). Slides may be archived in html. For our seminar, we archived the presentation in two ways. First, we attached the text of the presentation to the appropriate slides in the original PowerPoint presentation and then made that PowerPoint presentation available over the net. We also used Macromedia Flash to create an interactive movie of the slides with real-time audio. The audio files were converted to a standard format and imported into Flash. The slides were synchronized with the audio. Navigation buttons were added to each slide and a slide list was added to the overall presentation.

Lessons Learned

Our seminar took place on August 2, 2001 at 1:00 PM CDT. It lasted for about an hour and included participants from around the world. Overall, the seminar went quite well but, as with any new project, there are several things we will do differently in the future. Following are some suggestions for making the seminar run smoothly.

First, double-check everything. Make sure to start archiving several minutes before the speaker begins and double check archiving just before they start speaking. Check all equipment early the day of the seminar. Start streaming the web seminar announcement at least 2 hours

before the seminar and check it periodically. Double-check the synchronization of the audio delays.

Second, follow your chosen timeline as closely as possible. Allow for unexpected delays when setting your timeline. Set the dress rehearsal date early. There must be time to adjust for presenter preferences and to replace any malfunctioning equipment or software.

Lastly, advertise heavily to bring in the desired participants. For a low budget project find “free” interest lists. Check the sponsor of the project to see if they have such a list. Mention the seminar at conference presentations and have a signup list, so you can contact interested parties later. Send invitations as soon as you have the date set, and then again closer to the day of the seminar. Encourage anyone who registers to invite others. Make sure to include guest accounts for those last minute participants.

Summary

A web seminar can be a cost-effective and efficient means of communicating information to a geographically and economically diverse audience. The needs of the audience and the local resource requirements must be considered carefully to make the seminar a success. An outline of how to give a web seminar was given based on our experience developing a web seminar from concept through implementation. This outline should help others to successfully develop and deliver a web seminar of their own.

Acknowledgements

This work was supported in part by the National Science Foundation’s Course, Curriculum and Laboratory Improvement program under grant no. DUE-9952540.

This work was completed with services provided by the Instructional Software Development Center at the University of Missouri-Rolla.

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