

ePharmacology

An Electronic Performance Support System

Developed in partial fulfillment of the requirements of
ID&T 7/8095 at The University of Memphis

Dr. Michael M. Grant, sponsor

Presented by
Open JAR Solutions
Jerry Bates, Ray Chapman, Angela Macklin
April 2008

Client: Dr. William Brescia
Director of Instructional Technology, Office of Medical Education
University of Tennessee Health Science Center, Memphis, TN



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► Project Team: Open JAR Solutions

The principals in Open JAR Solutions are Jerry Bates, Ray Chapman, and Angela Macklin. The team was formed during the graduate course Development of Interactive Learning Environments II, at The University of Memphis, Spring 2008 semester. Team sponsor is Dr. Michael M. Grant.

All are graduate students with Instructional Design and Technology (IDT) as their major field of study. Each was significantly involved in each phase of the instructional design process: analysis, design, development, implementation and evaluation. The work breakdown structure capitalized on the specific talents of each member.



Figure 1: (from left to right) **Jerry Bates, Ray Chapman, Angela Macklin**

- **Jerry Bates** is an IDT doctoral student with project management and database experience. As project manager, Jerry will be responsible for managing client communication and ensuring that work progresses to meet deliverable schedule. Jerry will also serve as database assistant.
- **Ray Chapman** is an IDT doctoral student with IT and web database experience. Ray serves as the team web master and will head the database design and management efforts. He will ensure the interconnectivity of the web interface and the database backend. He is also the audio-video manager.
- **Angela Macklin** is an IDT Masters degree student who brings her document creation, web page design and audio/video editing experience to the team. In addition to work as an instructional designer, Angela will serve as the audio-video assistant.



► Target Audience and Client Information

Dr. William Brescia, the Director of Instructional Technology at the University of Tennessee Health Science Center (UTHSC) Memphis, TN submitted the following request for a product designed for second year medical students enrolled in the Medical Pharmacology course at UTHSC. The target audience was expected to continue to use the resource after completing their course.

The Office of Medical Education has a video of M3 students saying Drug names. I see this as the basis of a Pharm unit that will have the video with the correct spelling and pronunciation along with information about each drug. There could also be links to other resources.

It might even be the basis of a wiki.

A tool would have to be designed that would allow for new data to be entered so that students could add new information from clinical tests and delete old data.

Reviews of this type are key for students studying the proper use of current drugs.

As Director of Instructional Technology, Dr. Brescia provides services to the medical faculty at UTHSC. His client for the ePharmacology project is Tevor Sweatman, Ph.D., course director for Medical Pharmacology.



► Project Charter

Description

Project Need

Second year medical students at UTHSC take a Medical Pharmacology course where they are expected to learn the names and uses of drugs. At present, the course includes approximately 600 drugs. Course lectures and support materials present the drugs in categories according to usage and include the generic name, brand names, as well as correct spelling. In addition to learning the names and uses of drugs, it is important students learn correct American English pronunciation, in order to communicate with other medical professionals they meet in a clinical setting. Students currently learn to pronounce the names of the drugs through hearing them spoken by the professors and through replaying lectures on tape. Students learn by imitating what they hear. There is no other formal pronunciation tutor or performance support system in place to support this learning need. The course director reports that the current methods are not always adequate, as students provide anecdotal evidence of clinical incidents where they refer to a drug by name and are not understood by medical staff. One reported source of the problem is a pronunciation difference between American and British English: some lecturers speak American English, and others British English. Students thus need to learn to pronounce the drug names correctly in American English.

Project Description

The project will address this need by developing a pronunciation performance system. The system will be an interactive web-based product using a database engine available in the public domain. Use of the product will require Internet access, an Internet browser with appropriate plug-ins (including audio players), and earphones. The system's user interface will provide a visually intuitive menu system by which the learner can select the generic name of the practice item, view a phonetic spelling of the word, and view the drug's category and brand names. (Note: the phonetic spelling will not use the International Phonetic Alphabet.) The system will present a method for playing/replaying the model pronunciation of the generic name. The



initial system will provide between 30 and 50 working audio practice items. The backend will be designed so the owner can maintain the database. A job aid for maintaining and updating the pronunciation support system will be included. The product will include a supplemental list of resources where additional audio pronunciation guides can be found on the web. The host system has yet to be identified.

Project Start Date: February 6, 2008 (tentative, pending sign off on Project Charter)

Projected Finish Date: April 21, 2008

Goal and Critical Success Factors

Performance Goal

This course development will design, develop, test, and deliver a new on-line drug pronunciation performance system populated with a representative set of drugs that can be maintained by the system owner.

Critical Success Factors

The course development will be successful when:

1. Developers deliver a working database backend that accurately serves data to the web interface
2. Audio clips for 30-50 practice items are located, edited, and added to the system.
3. Developers deliver a web interface that is intuitive for learners
4. The user interface can access drug records in the system
5. Learners can easily navigate the web interface
6. Learners can readily play the pronunciation guide for the selected drug using the web interface
7. Learners can repeatedly practice pronunciations until they are satisfied with their performance
8. Learners believe using the practice system helps them learn to correctly pronounce the drug names.
9. System managers have access to the system for adding, deleting, and editing records.

Assumptions, Constraints and Risks

Assumptions

1. The client will identify the subset of drug names (“the sample”) to populate the initial system.
2. The client will prioritize and rank order the complete list of drug names, either by individual drug name or drug category.
3. The quality of the video tapes provided by client is such that they can be copied and digitized.
4. The quality of the digital version of the video tapes supports rendering quality audio tracks from them.
5. Existing sources for phonetic spellings of the sample words can be located.
6. Alternate sources of viable audio pronunciations can be identified for the sample, if provided video/audio is not usable.
7. The product will be developed on a Unix production server, separate from the UTHSC system.
8. A suitable host for the system will be identified.
9. The identified system host will have or can procure the necessary database backend software.



10. The team will be given access and appropriate permissions to the host system.
11. For system updating, client has someone who knows how to record audio to a digital media, to be uploaded to the website.
12. Learners will have access to high-speed Internet-connected computers with audio capacity.
13. User on-campus access will be located in the UTHSC library.

Constraints

1. Broadband Internet access is required.
2. The system host has yet to be determined (public server or private server at UTHSC)
3. Private host server's database backend has yet to be identified.
4. Existing Internet development applications and web-based database management tools will be used to develop the system
5. Server host system must be Linux-based.
6. The project will be developed using existing pronunciations (either harvested from provided video or other sources) of the words.
7. Access to subject matter experts to review and approve pronunciation content and drug categories is needed in order to validate the content.
8. Access to sample learners is needed to conduct a learner analysis so that the instruction takes learner characteristics into account.
9. Access to sample learners is also needed to conduct the formative evaluation to test the effectiveness of the system.

Risks and Obstacles

Risks:

1. Discerning the audio quality of the digitized video documents
2. Separating the audio track from the videotapes
3. Identifying an existing web-based database management tool that will support the needs of the project
4. Extent of the design team's expertise in web-based database design matched to the system used by the host
5. Establishing the link between the backend database and the frontend user delivery system
6. Locating and using phonetic spellings for the sample, without use of International Phonetic Association symbols

Obstacles:

1. Amount of time necessary to copy, record, render, and export video (e.g., one 60-minute tape to be recorded, rendered, and exported to computer video format file took 7 hours, with no editing)
2. Video processing time involved prior to evaluating the usability of the videotape
3. Successfully editing and cataloging the provided video documents
4. Implementing the project on a yet-to-be determined server host
5. Anticipated date of childbirth for database manager/web designer's wife: April 27, 2008.



Resources

Financial

\$25,000, based on reported industry standard for developing 1 hour of simple web-based instruction.

Personnel

1. Video/audio technician (copy/convert/ videotapes)	30 hours
2. Editing and cataloging video files	20 hours
3. Database design	20 hours
4. Website interface design and testing	60 hours
5. Team member cross-training	20 hours
6. Project analysis (includes context, learner, performance, learning context, goal analyses)	40 hours
7. Content analysis	15 hours
8. Instructional Strategy	15 hours
9. Treatment design, template, and storyboard	30 hours
10. Treatment Report	15 hours
11. Formative Evaluation	20 hours
12. Document creation/duplication	10 hours
13. Job aid production for UTHSC system manager	15 hours
14. Project management, communication, and meetings	140 hours
	<hr/>
	Total 450 hours

Material

1. Macintosh computer with external 500 gigabyte firewire hard drive
2. Audio/video editing software (iMovie)
3. Web development server with 120 gigabyte storage (PHP) (Linux-based)
4. 3 computers with access to the development server
5. 3 copies of course authoring application (Flash, Fireworks, and Dreamweaver; versions 8.0 or above)
6. Web-accessible project management application tools (Zoho project)

Approach

Analysis Report	February 13, 2008*
Project Plan	February 20, 2008*
Content Analysis	February 27, 2008*
Instructional Strategy	March 12, 2008*
Formative Evaluation Plan	March 19, 2008*
Treatment Design, Template and storyboard	March 26, 2008*
Initial course prototype	April 1, 2008
SME review	April 7, 2008
Formative evaluation	April 15, 2008
Final product delivery	April 21, 2008

* TWO days following date prescribed course milestone schedule



Roles and Responsibilities

<i>Name</i>	<i>Role</i>	<i>Responsibility</i>
Michael Grant	Project Sponsor	Monitor project
William Brescia	Client Representative	<ol style="list-style-type: none"> 1. Review and approve benchmark events 2. Provide access to learners for formative evaluation 3. Communicate progress with UTHSC course director 4. Provide access to in-house IT resources 5. Provide prioritized list of drugs for project sample 6. Subject matter expert for drug list and pronunciations
Angela Macklin	Team Contributor Instructional designer, team contributor Audio/visual assistant	<ol style="list-style-type: none"> 1. Share in writing/reviewing planning documents 2. Review and develop web materials 3. Assist with audio production/editing
Ray Chapman	Web master, web designer Database designer and manager Audio/video manager Instructional designer, team contributor	<ol style="list-style-type: none"> 1. Plan and execute team and product web site, with team review and approval 2. Plan and execute online system with team review and approval 3. Process videotapes 4. Manage audio production/editing/cataloging 5. Share in reviewing planning documents 6. Prepare job aid for UTHSC system maintenance 7. Cross-train team in web system
Jerry Bates	Project manager Instructional designer, team contributor Primary client contact Database assistant	<ol style="list-style-type: none"> 1. Plan and execute project 2. Prepare team weekly progress reports 3. Manage client communication 4. Share in writing/reviewing planning documents 5. Identify alternate audio sources 6. Review and develop web materials



► Project Plan

Revision History

#	Revision Date	Revised by	Approved by	Description
1.	2/18/2008		Grant 2/21/08	Original version submitted to Grant
2.	2/21/2008	Bates		Revisions incorporating Grant's reviews

Scope

The project will

1. Create an online system that presents drug names together with their audio pronunciation.
2. Use a public domain database software for the system.
3. Deduce the appropriate record structure for the database after analyzing the hierarchical structure inherent in the provided drug list.
4. Create the drug records beginning with the high priority items specified by the client, using 30-50 drugs as the minimum number. The system can accommodate up to four brand names for each generic drug name.
5. Acquire, catalog and store audio pronunciation files for the drug names.
6. Employ the following priorities for the audio sources: (1) new audio recording, (2) existing audio recordings located from third-party sources, and (3) renderings from existing video provided by the client.
7. Depending on available resources, locate existing phonetic spellings for drug names and add them to the drug record. (e.g., Hydralazine = [hye DRAL a zeen](#))
8. Design and create a web-based interface so learners can access the system from the network.
9. Design a user interface to support learner-selection of drug names for practice.
10. Provide on-screen controls for the learner to activate the audio file.
11. Develop the prototype using a development server that is separate from the client's system.
12. Collaborate with the client's IT representative to install and test the new system on the client's server.
13. Create a system maintenance job aid for the client's IT representative.



The following activities are critical to the success of the project, but beyond the scope of the project:

14. Quality video source files that can be efficiently rendered into audio files.
15. Authorization by M3 talent to use their audio-video recordings
16. Permission for design team to access client's host system.
17. Specification of where on the host system the product will reside (server space).
18. Learner access to high-speed Internet-connected computers with audio capacity.
19. Learners having on-campus access to the system through the UTHSC library.

What the project will NOT deliver:

1. All 692 drugs originally provided by the client. Instead, the project will deliver 30-50 drugs, based on the prioritized list provided by the client.

Work Breakdown Structure Deliverables

1. Analysis report

- 1.1. The analysis report will present the result of the initial project analysis. The report will describe the overall context for the performance system, the characteristics of the learners, and their specific learning context. The report will also describe the current and desired performance, and delineate the discrepancy between them which the system will be designed to address. The report will be presented to the client for review and approval.
- 1.2. As part of context analysis, the UTHSC IT resource will be consulted to determine the specifications of the host system, and a system accommodation plan will be developed.

2. Project Plan

- 2.1. The project plan (this document) will define the scope of the project and list the project deliverables. The plan describes the manner in which risk, changes, and communication will be managed. The schedule and the budget will be included in the plan, as will the plans for procurement and quality assurance. This plan will be presented to the client for review and approval.

3. Specification and Acquisition of Content

- 3.1. Using the prioritized list of drugs provided by the client, the drugs and their categories will be collated and presented to the client for review and approval.
- 3.2. New audio recordings will be created using qualified talent.
- 3.3. Existing audio files and phonetic spellings will be harvested from publicly available web sources. Sources will be disclosed in the system documentation.
- 3.4. Product specifications will outline technical requirements and features of the system.
- 3.5. The big picture description will be presented.
- 3.6. The features of the system will be presented in a high concept statement.

4. Rapid prototyping of system

- 4.1. The system will be designed on a development server, with test checkpoints for the host system.
- 4.2. A database system using an appropriate data structure, defined by the data dictionary, will be created and populated with the collated content.
- 4.3. A tested database connection will be established.
- 4.4. Flowcharts and storyboards for a custom-designed web interface will illustrate the visual design and explain usability and learner interaction points.
- 4.5. Successive prototypes of the system will be generated and presented for client review, with the following sequence: (1) "look and feel," (2) navigation, (3) access to content and (4) audio activation. The content access prototype will be populated with 5 working audio files.



5. Production and Formative Evaluation

- 5.1. A multi-stage formative evaluation plan will be presented, outlining the schedule, personnel, and evaluation instruments.
- 5.2. Following the prototype reviews, and the final product development, a formative evaluation will be conducted and thoroughly documented. The evaluation will include heuristic evaluation by a pair of e-learning subject matter experts. Then two sets of M2's will be engaged to perform an observed usability test. The results of the evaluation will be presented in an evaluation report.

6. Final system delivery and installation

- 6.1. System maintenance job aid will be delivered.
- 6.2. The product will be installed at client site.
- 6.3. The installation will be tested.

Risk Management Plan

ID	Description of Risk	Probability of Occurrence (1=low, 3=high)	Impact Description	Impact (severity value) (1=low, 3=high)	Response Strategy	(TENTATIVE) Responsible Person
1.	Quality of video files may not support efficient rendering into discrete audio clips	3	Alternate sources of audio clips will be necessary. One or both solution sets will be necessary	3	The risk will be <u>avoided</u> by using qualified volunteer to re-record the words and by locating pronunciations from publicly available sources.	<ul style="list-style-type: none"> • RC: determining usability • AM: managing new recordings and creating digital files • JB: locating existing audio pronunciations
2.	Client server not compatible with Linux-based product	2	The product will have to be served from another host.	2	This risk will be <u>mitigated</u> by having another host available to serve the system.	RC
3.	Learners not available for formative evaluation phases	2	The prototype could be limited in its ability to meet the client needs, due to inadequate testing.	1	This risk will be <u>mitigated</u> by attempting to gain access to other medical students for testing.	AM/JB
4.	Phonetic spellings cannot be located for all words within the delivery time frame	2	Product will not be able to deliver the additional pronunciation cue for all words, which lessens the level of performance support.	1	This risk will be <u>accepted</u> , as the client has indicated this feature could be omitted.	AM/JB
5.	Pregnancy complications and/or early delivery for database programmer's wife	1	Technical difficulties during product installation may delay sign-off.	3	This risk will be mitigated by cross-training other team members for installation tasks.	Ray Chapman
6.	Delays in access to subject matter expert to review and confirm content	1	Can delay product development and, if access is not available, can jeopardize content accuracy.	2	This risk will be mitigated by building in sufficient time for the SME to review the product.	AM
7.	Unstable Internet access on client host system	1	Will interfere with conducting formative evaluation in timely manner at client site.	1	This risk has to be accepted, since control of this risk is out of the hands of the design team.	Matt Grayson, UTHSC IT representative and RC
8.	Existing pronunciations harvested from the web only approximate pronunciations common in this geographic region.	1	May compromise the client's desire for regionally accurate pronunciations, although the pronunciations will still be acceptable within the broader medical community.	1	This risk is acceptable because a valid pronunciation is better than no pronunciation.	AM/JB



Change Management Plan

To ensure the product is delivered on time and according to specifications, every change request must be submitted in writing (email is acceptable) and the reasons for the change explained. This includes both internal and external change requests. Requests should be directed to the Project Manager.

To submit a change request, provide the following information in writing to the project manager:

- What needs to be changed
- Why is this change needed
- On a scale of 1-5, with 5 being “most critical,” rank the importance of the change.
- (A sample change request form is provided in the Appendix)

Project manager:

- Reviews the request
- Logs its receipt in the change management log (sample shown in the Appendix)
- Finds the appropriate team member to be responsible for the request
- Communicates the request to responsible team member

Responsible party:

- Reviews the description and, if needed, consults with the source for needed clarification.
- Analyzes request to see what impact it will have on project scope, time requirements, resources, and quality; consults with other team members if desired
- Prepares impact statement and recommendations (accept, deny, postpone), together with rationale.
- Records statement and recommendations in change management log.
- Presents recommendation to appropriate stakeholder(s) (e.g., sponsor, other team members, client) for review and approval.
- Records stakeholder feedback in change management log
- Finds the team member to be responsible for managing the change
- Notifies the project manager of completed analysis, recommendations, feedback, and assignment

Project manager:

- Signs off on change request/recommendation/assignment
- Monitors the change process and updates status in change management log



Schedule

Ref#	Deliverable	Start	End
1.0	Analysis Report	2/5/2008	2/22/2008
2.0	Project Plan, with client review and approval	2/11/2008	2/22/2008
3.0	Specification and acquisition of content		
3.1	Get drug list prioritized by client.	2/12/2008	2/19/2007
3.2	Create new audio recordings	2/25/2008	2/29//2008
3.3	Harvest existing pronunciations and phonetics.	2/25/2008	2/29//2008
3.4	Product specifications for technical requirements of system.	3/3/2008	3/10/2008
3.5	Big Picture description	2/27/2008	2/25/2008
3.6	High concept statement	3/3/2008	3/10/2008
4.0	Rapid prototyping of system	2/15/2008	3/22/2008
4.1	Set up development server	2/19/2008	2/20/2008
4.2	Create record structure for database tables	2/15/2008	2/17/2008
4.3	Build and test database connection	2/15/2008	2/20/2008
4.4	Flowcharts and storyboards	2/15/2008	2/17/2008
4.5a	Successive prototypes: look and feel	3/3/2008	3/10/2008
4.5b	Navigation prototype	3/10/2008	3/17/2008
4.5c	Content access prototype	3/17/2009	3/19/2008
4.5d	Audio activation prototype	3/19/2008	3/21/2008
5.0	Production and Formative Evaluation		
5.1	Formative evaluation plan	3/11/2008	3/17/2008
5.2a	Design change freeze date	3/21/2008	3/21/2008
5.2b	Final production	3/24/2008	3/31/2008
5.2c	Heuristic evaluation	4/2/2008	4/3/2008
5.2d	Alpha usability test with students	4/8/2008	4/9/2008
5.2e	Beta usability test with students	4/10/2008	4/11/2008
6.0	Final system delivery and installation		
6.1	System maintenance job aid	4/11/2008	4/21/2008
6.2	Installation	4/15/2008	4/15/2008
6.3	Test installation	4/16/2008	4/17/2008



Budget

	Resource	Qty	Hrs each	Rate	Total Cost	Team Hours	Assoc	Mgr	client	outside
Project Charter	Project Associates	2	2	30	\$120	4	120	-	-	-
	Project Manager	1	12	30	\$360	12	-	360	-	-
Analysis Report	Project Associates	1	1	30	\$30	1	30	-	-	-
	Project Associates	1	12	30	\$360	12	360	-	-	-
	Project Manager	1	2	30	\$60	2	-	60	-	-
	Client	1	1	40	\$40	-	-	-	40	-
Project Plan	Project Associates	2	1	30	\$60	2	60	-	-	-
	Project Manager	1	12	30	\$360	12	-	360	-	-
	Client	1	1	40	\$40	-	-	-	40	-
Specify/acquire content	Project Associates	2	16	30	\$960	32	960	-	-	-
	outside	1	2	40	\$80	-	-	-	-	80
Big picture and high concept	Project Associates	1	8	30	\$240	8	240	-	-	-
Product specifications	Project Associates	1	8	30	\$240	8	240	-	-	-
Database creation and connection	Project Associates	1	60	30	\$1,800	60	1,800	-	-	-
Rapid prototype	Project Associates	1	120	30	\$3,600	120	3,600	-	-	-
	Project Manager	1	8	30	\$240	8	-	240	-	-
Production	Project Associates	2	120	30	\$7,200	240	7,200	-	-	-
	Project Manager	1	30	30	\$900	30	-	900	-	-
Formative Evaluation	Project Associates	2	24	30	\$1,440	48	1,440	-	-	-
	Project Manager	2	8	30	\$480	16	-	480	-	-
	Outside	2	1	40	\$80	-	-	-	-	80
	Client	8	1	40	\$320	-	-	-	320	-
Final system delivery, installation, training	Project Associates	2	12	30	\$720	24	720	-	-	-
	Project Manager	1	4	30	\$120	4	-	120	-	-
	Client	1	4	30	\$120	-	-	-	120	-
					\$19,970	643	\$16,770	\$2,520	\$520	\$160
								\$19,290		\$680

Materials

- Paper for job aids (1 ream @ \$4.50)
- AIM Lab recording and processing time (32 hours @ \$5/Hr = \$135; contributed by U of M ID&T Department)



Staffing Plan

Staff needed	Availability	Time Required
INTERNAL		
Video dubbing technician	January 23-31	12 hours
Systems analyst and database programmer	February 15-April 11	80 hours
Audio recording technician	February 25-29	10 hours
Web interface designer	March 3-April 11	60 hours
Instructional designers	January 15-April 17	125 hours
Project Manager	January 14-April 24	160 hours
EXTERNAL		
Outside talent to pronounce drug names	February 25	2 hours
Formative evaluation participants	April 2-11	8 hours
Subject matter expert to review and prioritize lists	February 20-25	3 hours

OJS Team Members:

Ray Chapman: systems analyst, database programmer, instructional designer

Angela Macklin: audio recording technician, instructional designer

Jerry Bates: project manager, instructional designer



Communication Management Plan

Communication outlined here includes team, sponsor, and client communication.

- Client representative: Dr. Brescia
- Project sponsor: Dr. Grant
- Team: Angela Macklin, Jerry Bates, Ray Chapman

What	To Whom	When	By Whom	How
Client Meeting and receipt of drug lists and videos	Dr. Brescia	January 22	Team	Face to face at UTHSC
Weekly progress reports indicating open matters, upcoming events requiring client review.	Dr. Brescia	Monday evening	Project manager	Normally e-mail
Weekly team meetings		Sunday, 3 pm Monday 5:30 pm	Team Team/Grant	In person (Browning Hall) In person (AIM Lab)
Team status reports	Dr. Grant	By 5:30 each Monday	Project Manager	Posted to team website
*Project Charter	Dr Grant, then Dr. Brescia	February 4, then 4 days later to Dr. Brescia.	Jerry Bates	Website for sponsor; email attachment for client
Feedback about documents for review	By Dr. Brescia	Within 48 hours of receipt of documents	Associate responsible for report	Via email; associate will followup with phone call if no response received.
*Analysis Report	Dr Grant, then Dr. Brescia	February 11	Angela Macklin	
Determination of which drugs to include in the system	Dr. Brescia (and Course Director, via Dr. Brescia)	February 20	Ray Chapman	Via email
Determination of UTHSC host system capability and availability	Matt Grayson and Dr. Brescia	February 20	Ray Chapman	Via email
Request for vita (credentials) of recording talent	Talent	February 18	Ray Chapman	Via email
*Project Plan	Dr Grant, then Dr. Brescia	February 18: Grant February 21: Brescia	Jerry Bates	Website for sponsor; email attachment for client
*Big picture Description	Dr Grant, then Dr. Brescia	February 25	Angela Macklin	Website for sponsor; email attachment for client



What	To Whom	When	By Whom	How
*Product specification & high concept statement	Dr Grant, then Dr. Brescia	March 10	Ray Chapman	Website for sponsor; email attachment for client
*Formative evaluation plan	Dr Grant, then Dr. Brescia	March 17	Jerry Bates	Website for sponsor; email attachment for client
*Treatment design, templates, flowcharts, storyboards, style sheets.	Dr. Grant, then Dr. Brescia	March 24	Ray Chapman	Website for sponsor; email attachment for client
*Formative evaluation report	Dr. Grant, then Dr. Brescia	April 28	Angela Macklin	Website for sponsor; email attachment for client
Meetings with client	Dr. Brescia	As needed	Project associates	Via telephone or face to face
Team updates on client phone or face-to-face contacts	Project associates	Per each contact	Project associates	Post summary of conversation on team management site in discussions, send notice to team for review

NOTE: Items marked with asterisk(*) are course deliverables. They are submitted to the sponsor on the specified date. Revisions are made following sponsor feedback and then submitted to the client. The turn around time to the client is expected to be within 72 hours of the original submission date. Client response is anticipated within 48 hours of receipt.



Procurement Plan

- Audio processing time will be procured from the Instructional Design and Technology's Advanced Instructional Media (AIM) lab during open lab hours.
- Talent for re-recording will be procured from R.N. from St. Jude Research Hospital
- Production server access will be procured from Ray Chapman.
- Project management tools will be procured from a suite of online tools available free from ZOHO.com
- Domain name registration for the production server will be procured by Ray Chapman.
- Interface design software (Dreamweaver, Fireworks) will be licensed from Adobe; web system delivery tools will be procured from open source database/data connection

Quality Assurance Plan

To ensure a quality product, the following quality assurance steps will be taken

- The data transfer of drug names from client source document to Excel will be thoroughly proofread.
- The database of drug names will be presented to the client to procure subject-matter expert review and confirmation of classification accuracy.
- The selection of which drugs to use for the system will be made based on the priorities given by the client.
- Rapid prototyping will be used in product development to provide intermediate check points. The client will be provided with the following types of prototypes: "look and feel," navigation, content access, and audio activation.
- The database system will be thoroughly tested on the production server.
- The installation of the system on the client host server will be thoroughly tested. Installation will be scheduled for April 15, 2008, with testing to follow on April 16 and 17.
- A thorough formative evaluation of the product at three phases of design will be conducted, with revisions made in accord with findings. The first phase will involve two eLearning experts testing the system for usability and breakpoints. The second phase will present M2 volunteers with a list of 5 categorized drugs from the system. This test will be repeated with three separate volunteers. In the test, volunteers will be asked to locate each of the specified drugs and play its respective audio file. One of the design team members will silently observe the performance to see how the user interacts with the system, noting any technical or interaction difficulties or confusions. This information will be used to revise the system for usability and may indicate a need for revising instructions. The third and final phase of the formative evaluation will repeat the phase two protocol, but using the revised system. This beta test will be repeated with five new M2 volunteers.



Glossary

Acceptance: the risk response strategy which acknowledges the risk and proceeds with the expectation that the impact will be minor.

Analysis Report: The analysis report includes the following components: context analysis; learner analysis; performance analysis with desired performance, actual performance, possible causes for performance discrepancy, what this proposal will address and purpose statement.

Avoidance: the risk response strategy which eliminates the risk by not undertaking the causal activity.

Content Analysis: The content analysis presents (1) the purpose of the task/content analysis with subject-matter expert validation; (2) the curriculum map with prerequisite skills identified; (3) performance objectives and assessment items. The analysis identifies the tasks together with their objectives, the Bloom's taxonomy level to which each objective belongs, and the assessment times for each objective.

Formative Evaluation Plan: The formative evaluation plan outlines the schedule for the stages of the formative evaluation, indicates who will be involved, and delineates the method for each of the phases. The instruments used for each phase will be included.

Mitigation: the risk response strategy which undertakes a reduction in the severity of the impact.

Php: The server-side hypertext preprocessing script used to enable the creation of dynamic web pages. (<http://en.wikipedia.org/wiki/PHP>)

Record: A record is the database unit used to store the information for a single drug name. The record is structured to contain the individual types of information needed to describe the drug. The structure for this record will be defined as part of the database design process. Example: name of drug (Hydralazine), category to which it belongs (antihypertensives), subcategory (direct vasodilators), brand name (Apresoline), phonemic spelling ([hye DRAL a zeen](#)), and audio file.

Research-based Instructional Strategy: The instructional strategy delineates the sequence and cluster of objectives, the pre-instructional strategies, and the assessment. The content, student participation strategies, and media selections are also included in the instructional strategy.

Transfer: the risk response strategy which places the risk management in the hands of another part outside the project development team.

Treatment Plan: The treatment plan provides a description of the site together with the rationale. The plan also presents the design of the interface.



Sample Change Request Form

What needs to be changed?

What are the reasons for this change?

On a scale of 1-5, with 5 being "most critical," rank the importance of this change.	1 Least critical	2	3	4	5 Most Critical
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Submitted By: _____ Date: _____

Received By: _____ Date: _____

Request ID# _____



Change Diary

A summary of change requests, irrespective of the final determination.

<i>Request #</i>	<i>Request Date</i>	<i>Source</i>	<i>What needs to be changed?</i>	<i>What are the reasons for the change?</i>	<i>Rank: 1-5</i>
001	02/25/08	Brescia, via discussion with Ray	The system needs to include all 89 drugs from the "Autonomic Drugs to Know" document.	This is the list the faculty member most wants to have included in the system.	5
002	03/10/08	Brescia	Incorporate programming capacity so UTHSC can add video clips for each drug name at a later date.	Faculty member believes video will enhance the product and desires the functionality, to be implemented in the future.	5

Change Management Log

1. Request #	2. Request Date	3. Submitted by	4. Person responsible for review	5. Impact statement	6. Recommendation with rationale	7. Review feedback summary per appropriate stakeholder(s)	8. Final determination	9. Person responsible	10. Current status and date
001	2/25/08	Brescia	Bates	Required to meet faculty expectations	Accommodate, as this is critical to product success		Accepted	Team	2/28/08
002	3/10/8	Brescia	Chapman	Impacts server storage requirements, interface presentation, database structure, programming	Accommodate: Course director considers video a critical piece of the product		Accepted	Chapman	3/15/08



► Project Evaluation Report

Project goal

This project will design, develop, test, and deliver a new on-line drug pronunciation performance system populated with a representative set of drugs that can be maintained by the system owner.

Project objectives and results

Product specifications and critical success factors	Result
1. A database of generic drug names, categories, subcategories, descriptions, brand names, phonetic spellings, and audio pronunciations.	<ul style="list-style-type: none">• A database with two tables was created. One contains the categories, and the other contains the drugs. The record in the drug table includes all the specified fields. The database was created using MySQL.
2. The database must be accessible to the users through a Web interface, which is neither platform nor browser dependent. This interface must be intuitive and easily navigated.	<ul style="list-style-type: none">• Data in the database is dynamically available to users using data connections scripted using the open-source PHP hypertext preprocessor which delivers the user-selected content to the html Web page.• The web interface was successfully tested with Firefox, Internet Explorer, and Safari browsers, and on both the Macintosh and Windows operating systems. Formative evaluation results indicated the interface was intuitive and easy to navigate. All the information in the database is dynamically available to the users through the Web interface.
3. The user must be able to access a drug name by its category and repeatedly play an audio pronunciation of the generic name for the drug, through the web interface.	<ul style="list-style-type: none">• Users can select a drug name from a list which is sorted by the categories, and use the audio control displayed on the web page to activate an audio pronunciation of the generic name of the drug. Formative evaluation results demonstrated the system permitted users the replay the audio file as needed.



Product specifications and critical success factors	Result
4. The product must be initially populated with 90 drug names.	<ul style="list-style-type: none"> The system is populated with the complete list of Autonomic drugs, which is the category selected by the client. This general category contains subcategories, and within the subcategories, a total of 89 drugs.
5. The product must support expansion to a comprehensive list of drugs, which at present contains 700 drugs.	<ul style="list-style-type: none"> The system can accommodate virtually unlimited expansion to the database. The team has pre-loaded these additional drugs into the database, at the client's request. All that is left for the client to do is add the audio links and the phonetic spellings for these additional drugs.
6. The product must be able to accommodate video clips (provided by UTHSC) which UTHSC plans to add at a later date.	<ul style="list-style-type: none"> The record structure in the drug database contains a field for the address of a video file; a directory for the video files has been established on the client's host server; and the user interface includes a location to display the video clip. Testing confirmed an interactive video control displays and works. A generic Flash video was also included and displays a placeholder "video not yet available" message.
7. Audio files for the pronunciations may be derived from video files provided by UTHSC, retrieved from authoritative external sources, or recorded by new subject matter experts.	<ul style="list-style-type: none"> Eighty of the 89 audio files were sourced from the University of Maryland Medical Center's Complementary and Alternative Medicine Index (http://www.umm.edu/altmed/) which licenses the content from A.D.A.M.com (http://www.adam.com). The remaining audio was recorded by the project team, using an R. N. from the University of Memphis's Student Health Center.
8. The site must be designed to conform to and use the UTHSC Medical Library server specifications: OS X (10.4), 250 GB storage, 2GB RAM, php 5.0 (minimum), MySQL 5.1 (minimum), SQLite 3.0 (minimum), support for SSH/SFTP, 10/100/1000 ethernet adapter, and Linux based system.	<ul style="list-style-type: none"> The product is fully compliant with the specifications of the client's web host. As delivered, the system uses 1,322 kb (1.3 megabytes) of storage. Estimated future local host storage per audio file is 76kb; for video file is 45kb per second.
9. The system will be hosted by the UTHSC Library and will not require a user login.	<ul style="list-style-type: none"> The system is hosted at http://library.utmem.edu/epharm/ which is an open access web address.



Product specifications and critical success factors	Result
10. System maintenance documentation must be included with the product to delineate how to add, change, and delete database entries. System managers will have access to the system to conduct needed maintenance.	<ul style="list-style-type: none"> • A printed job aid with screen captures was produced together with written instructions on how to maintain the database. A hands-on training session was conducted with the sponsor to provide practice in accessing and maintaining the database. Access to these functions is restricted to validated user name and password provided by the client's web administrator.
11. Learners will perceive the system as useful in helping them learn to correctly pronounce drug names.	<ul style="list-style-type: none"> • Survey items in the formative evaluation phase indicated users perceived the system useful for learning to correctly pronounce drug names.
12. NOTE: The product was originally Pharmaco-Phonetics.	<ul style="list-style-type: none"> • Name simplified to ePharmacology.

Scope Comparison

To compare the planned and actual scope, the project manager prepared an initial draft which was reviewed by the database designer who concurred with the analysis and corrected the technical descriptions.

Planned Scope

OpenJAR planned to:

14. Create an online system that presents drug names together with their audio pronunciation.
15. Use public domain database software for the system.
16. Deduce the appropriate record structure for the database after analyzing the hierarchical structure inherent in the provided drug list.
17. Create the drug records beginning with the high priority items specified by the client, using 30-50 drugs as the minimum number, and accommodate up to four brand names for each generic drug name.
18. Acquire, catalog and store audio pronunciation files for the drug names.
19. Employ the following priorities for the audio sources: (1) new audio recording, (2) existing audio recordings located from third-party sources, and (3) renderings from existing video provided by the client.
20. Depending on available resources, locate existing phonetic spellings for drug names and add them to the drug record. (e.g., Hydralazine = [hye DRAL a zeen](#))
21. Design and create a web-based interface so learners can access the system from the network.
22. Design a user interface to support learner-selection of drug names for practice.
23. Provide on-screen controls for the learner to activate the audio file.
24. Develop the prototype using a development server that is separate from the client's system.
25. Collaborate with the client's IT representative to install and test the new system on the client's server.
26. Create a system maintenance job aid for the client's IT representative.
27. NOT include all 692 drugs originally provided by the client. Instead, the project will deliver 30-50 drugs, based on the prioritized list provided by the client.



Additional Scope

The following elements were added to the project scope:

28. The client identified the Autonomic drugs as the priority list. The number of drugs in this group (89) exceeded the original scope, but was necessary to meet the client's prioritization. Audio and phonetic spellings were provided for these 89 drugs.
29. In addition, the complete list of 692 drugs were preloaded into the database, per client request. This includes the category, drug name, treatment area(s), and brand name(s) for each.
30. At client request, database and interface capacity supporting client's future addition of video clips was added to the system. A Flash placeholder for the video clip was also created and linked in the database.
31. An external source for additional audio files was located, which the client may link to add audio capability for the remainder of the drugs in the comprehensive list.

Decreased Scope

32. Due to the time constraints of the class, and the estimated time required to copy the video tapes, it was not possible to use the original video tapes as a data source for the audio pronunciations. Instead, an alternate web source was identified, with links to the audio clips incorporated into the system. For those drugs in the Autonomic category not found in the external source, local talent was used to record new audio files. Phonetic spellings for those drugs were located elsewhere.
33. Hosting the development product was initially attempted on a host server separate from the client's system. However, data connection issues prevented the use of this host. Consequently, access to the the client's host server was requested and received, and used to test the development product. Development utilized a WAMP server installed as a local host, MySQL for the database, and AJAX (asynchronous JavaScript and XML) to connect the data to the web interface.

Cost Performance

Using the time budget projected in the original project charter, the following comparison of budget to actual was conducted.

Project Team Personnel

FTE Time in Project Charter	Budgeted Hours	Actual Team Hours				Over (under) budget /% of budget	
		Ray	Angela	Jerry	Total		
15. Video/audio technician (copy/convert/ videotapes)	30	8.00	2.00		10.00	(20.00)	33%
16. Editing and cataloging video files	20					(20.00)	0%
17. Database design	20	10.00		7.50	17.50	(2.50)	88%
18. Website interface design and testing	60	79.50	3.00	22.75	105.25	45.25	175%
19. Team member cross-training	20					(20.00)	0%
20. Project analysis (includes context, learner, performance, learning context, and goal analyses)	40	1.50	12.50	36.75	50.75	10.75	127%



21. Content analysis	15		7.00	7.00	(8.00)	47%	
22. Instructional Strategy	15				(15.00)	0%	
23. Treatment design, template, and storyboard	30	2.00	3.75	5.75	(24.25)	19%	
24. Treatment Report	15		7.23	7.23	(7.77)	48%	
25. Formative Evaluation and reporting	20	8.00	19.58	27.58	7.58	138%	
26. Document creation/duplication	10				(10.00)	0%	
27. Job aid production for UTHSC system manager	15	16.00		16.00	1.00	107%	
28. Project management, communication, and meetings	140	27.00	24.00	86.00	137.00	(3.00)	98%
Total	450	144.00	49.50	190.56	384.06	(65.94)	85%

External Costs

Cost Categories	Budget	Actual	Over (under) budget
Labor (in hours for consultants, contract labor)			
Outside talent to pronounce drug names	2	1	(1)
Formative evaluation participants	8	4	(4)
Subject matter expert to review and prioritize lists	3	2	(1)
Total	13 hours	7 hours	(6) hours
Equipment, hardware or software			
AIM Lab recording and processing time (estimated 32 hours @ \$5/Hr = \$135; contributed by U of M ID&T Department)	\$135.00	\$ 40.00	(\$ 95.00)
WAMPserver, PHP, and MySQL	-0-	No charge	--
Creative Suite 3	-0-	0 (free 30 day trial)	--
Prorated cost of development server at ed-u-cate.org	-0-	\$ 27.96	\$ 27.96
Travel and Training; installation and training; formative evaluation reviews; meetings with client at UTHSC (mileage costs at federal rate of \$0.505/mi)	-0-	\$ 62.87	\$ 62.87
Paper for job aids (1 ream at \$4.50 estimated)	\$4.50	\$ 4.50	--
SurveyMonkey monthly charge for needs analysis; project followup: 2 months at \$19.95/month	-0-	\$ 39.90	\$ 39.90
Color copies for job aid	-0-	\$ 40.00	\$ 40.00
Total	\$139.50	\$215.23	\$75.73



Summary of Budget to Actual Cost Performance

As these results show, team time came in at 85% of budget overall, but there were notable exceptions in individual task areas. Specifically, website interface design and testing (175% of budget), formative evaluation (138%), overall project analysis (127%), and job aid production (107%) required more time than anticipated. Savings were realized in the areas of video tape processing, team member cross-training, and development of instructional strategy. This latter savings was realized because there was no instructional strategy to develop in a performance support system. The treatment design also required less time than budgeted, but if more prototypes had been generated, the process may have approximated the budgeted time.

External costs also varied from the budget. External labor costs came in under budget. AIM Lab costs were also under budget, due to the fact that the original plan to process video was not pursued. Additionally, there were project cash costs for the project. Of these, only the paper for job aids had been factored into the original budget.

Schedule Performance

	Estimated	Actual
Project completion date	April 21, 2008	April 21, 2008
<i>Explanation of schedule variance:</i> The product was delivered on time. However, from a time perspective, the project was over budget.		

Process perspectives

An online survey was developed during the April 20, 2008 team meeting to ask questions of each stakeholder group. Distributed via email on April 21, 2008, the survey was closed on April 27, 2008. Responses were received from all three team members, the instructor, one of the two eLearning experts, and the primary client. Responses used a 5-point Likert-style scale with 1=Strongly Agree to 5=Strongly Disagree. Survey results are shown in Table 1. Results disaggregated by respondent group are available in the Appendix.

Table 1: Process Perspectives Survey

Category	Question	Overall Mean Response*
Instructional Design	The product met the original proposal expectations.	1.67
	The product met the terms of the proposal outlined in the team's project charter.	1.33
	The design process successfully identified the essential element(s) for this performance support system.	1.67
	The ePharm website follows a logical order.	1.17
	The ePharm content is at a level appropriate for the end user.	1.17
	The database management job aid follows a logical progression.	1.50
	The database management job aid adequately addresses the need for which it was requested.	1.50
		Instructional Design (Agree to Strongly Agree) 1.43
Development Process	Rapid prototyping was an effective process for developing this project.	1.50
	The Open JAR team effectively utilized the rapid prototyping process.	2.00
	I had adequate opportunity to provide feedback to the product during the development phase.	1.67



	Changes to the product were implemented in a timely manner.	1.50
	Product revisions appropriately reflect formative evaluation findings.	1.33
Development Process (Agree to Strongly Agree)		1.60
Project	Overall, communication with me was conducted in a timely manner.	1.67
Management:	Overall, communication with me contained the information I needed.	1.50
Communication	I believe my input to the project was given careful consideration.	1.33
	From my perspective, the right type of communication (email, face to face meeting, phone) happened at the right time.	1.80
Project Management: Communication (Agree to Strongly Agree)		1.58
Project	I was able to contribute my knowledge and skills to the development of the product.	1.83
Management:	I knew what was expected of me during the development process.	1.50
Roles and Responsibilities		
Project Management: Roles and Responsibilities (Agree to Strongly Agree)		1.67
Project	The project's intermediate deadlines were met.	1.83
Management:	The project's final deadline was met.	1.33
Time	The timeline outlined in the project plan was appropriate for a project of this scope.	2.33
Management	The timeline outlined in the project plan was realistic.	2.50
Project Management: Time Management (Agree)		2.00

* Range: 1=Strongly Agree to 5=Strongly Disagree

In addition to the Likert-style response items, two open-ended questions were included in the survey. The following comments were collected.

Respondent group	What are your general impressions about the overall process involved in the development of the ePharm product?
TEAM	<ul style="list-style-type: none"> (no response) Although the project is in its final phases, I feel that it is important that the team gets together to discuss how everything was "put together". The process was rocky at times. In my opinion, this was due both to skills needed to develop the project we bargained for when we selected this project (and didn't realize we didn't have), and to incomplete communication (both within the team and with our client). We were learning how to deal with a client, how to manage a project, how to create a database, how to design a web page using style sheets, what EPSS actually was, and how to negotiate differences between the development process scheduled in the course outline and the detour we had to take to try rapid prototyping, a process we really had little experience using. Working as a team was also very challenging, especially when it came to knowing who would take care of what elements and which components we could effectively share. I'm not sure we navigated that area very well. However, we DID produce what we outlined in our charter, and we did deliver it on time. On budget? Jury is still out on that, as we still need to get an accurate picture of the time involved.
CLIENT	<ul style="list-style-type: none"> I would have liked more f2f meetings and some notion of what the product was looking like. Even non-functioning screen shots would have helped.
EXPERT	<ul style="list-style-type: none"> I don't know enough about the inner workings of your team and process to comment with much depth, but the fact is you produced a working product, and the client seemed satisfied.



- INSTRUCTOR
- I think it became evident that your time estimations were grossly estimated given that your team did not originally possess the skills necessary to produce the product. This would, of course, improve in the future with estimations and with development of this kind. I believe the rapid prototyping approach was successful for functionality, and future projects would benefit from other types of prototypes, such as layout and design.

Please provide any suggestions you would like to offer us for improving our process.

- TEAM
- Everyone needed to be involved in the development process.
 - (no response)
 - -Communication is critical.... Our communication plan did not seem to be a living document. -Meet with our client to review each documentation piece in turn, to better judge its reception. -Start earlier on graphic design pieces --to both get outside help and feedback from the client. -Hindsight is 20/20. Was this a good project for our existing skill set? Or it it require too big a reach beyond our grasp? -Realistically find out your team's talents before signing up for a project!
- CLIENT
- More.
- EXPERT
- You did a good job. On some questions I answered "neutral" because either I didn't know, or it wasn't applicable to my role in the project.
- INSTRUCTOR
- Consider how much time was added in order to learn to produce your product. Consider how much time was required to produce a performance product v. what you would consider necessary for an instructional product. Are there ways you could decrease the development time you had? Are there ways to do more of the project tasks concurrently? Are there ways to increase accountability among team members and increase communication?
-



Lessons Learned

Group Discussion (April 20, 2008, team meeting with Jerry Bates and Ray Chapman)

- We experienced some isolation in executing our particular responsibilities. We solved it by reaching out to team members and asking for help. Part of this was inevitable because we capitalized on the skill sets of individual team members, but we had to learn to reach out for help. Some of these people included other team members, Dr. Grant, Matt Grayson (at UTHSC), JongPil Cheon, and various user groups on the web.
- We discovered that some technical issues take care of themselves (due the dynamic nature of of web applications). (Example: the press spacebar message)
- Communication among a team composed of people with various work schedules, varying access to email, and other responsibilities can pose a challenge.
- We encountered various technical complexities which posed challenges. For instance, the developer machine encountered the “blue screen of death” while others’ computer spent “time in the shop.” Running a backup or burning a CD for archive purposes was a necessary safety measure. This applied to the course website, individual work files, as well as the end product we were developing
- In terms of activity duration and cost, once we decided we weren’t doing any video editing or all 700 drugs, and not rerecording any drugs, that cut our time considerably. We came in under budget because we were creative. On the other hand, it took much longer to establish a data connection between the database (which was easy to build) and the website. This is located in a “Connections” folder on the UTHSC library server. If UTHSC removes us as a user of the database, they will need to change the php file in Connections folder (created by Dreamweaver), in addition to generating their own username and password.
- Regarding relationships with clients, we found Dr. Brescia to be a man of few questions, although he was adamant about the video part, and this somewhat strained the relationship.
- We learned early on what we were capable of delivering, and built this into our charter’s constraints: they wanted 700, we promised 50, and we delivered 79 (11% of the total request, but 158% of our charter). The core deliverable was a functioning database, which could accommodate as many drugs as they wanted to add or as their server would hold. We delivered audio on a client-selected subset of the complete database.

Individual Lessons Learned

Submitted by Angela Macklin

- First, I feel like Dr. Grant wanted each of us to work on each section together to learn how to do them. This is something that we really did not do. Second, another lesson learned is that if you don't have all the skills needed to complete a project be ready to learn. Don't be afraid of taking on a project. This is an opportunity to learn new skills. If you have not handed over the project to the client, I was thinking about the space at the bottom of the Illustrated Guide page. Maybe under the title we could create a Flash object that has some pills scrolling across or several pill pictures changing after a few seconds.



Submitted by Ray Chapman

- Technical
 - Initially I felt that I would have no problem getting the database to communicate with the website. In the past, I have worked on IIS, MS Access type databases and had no problems. However, working with SQL and Linux posed a challenge for me. Reflecting upon this experience, I am glad that I was able to learn something new and possibly use how I was able to create the connection in other project.
 - Although I often times tell others that they should backup their data on their PC, it is a practice that I sometimes overlook. Due to the several instances of the “Blue Screen Of Death” on my laptop, I have learned that I should practice what I preach and backup data on a regular basis.
- Team
 - Working as a team has been a very interesting concept for me. Many times, as I have worked on project, it has been an individual effort. I have learned that everyone on the teams needs to have a somewhat active role in each component of the project. As a team, I felt that we did not do as good of a job as we should have in letting each other in on what we were working on due to time constraints. I tend to work better on my own and I perceived that it was time consuming to stop what I was doing in order to bring others up to speed, as well as, vise versa.
- Communication
 - I have learned that not all communication is effective communication. Although we agreed to utilize the Zoho Projects website, I eventually found it as ineffective. Communications in a more direct manner (i.e. email, phone conversations, face-to-face meetings) were a more effective means of communication and would be my preference in the future.
- Instructional Design
 - In the design of our project, we did not use any of the information that I have learned in instructional design. Our project was one of those instances where there was no instruction. This has taught me that not all instructional design will be instructional.
- Project Management
 - The first lesson learned for me as it pertains to project management is that one should know their capacity. I felt that it would be an excellent opportunity for me if I was the project manager, however, with my wife expecting our second child, I knew it would have been too much of a challenge for me.
 - I have also learned the importance of planning out your project prior to starting. In the past when I have worked on projects, I generally did not have a plan. The planning phase of project management allows an opportunity to outline all of the tasks necessary to complete the project, as well as, outlines a timeline in which those tasks should be completed.

Submitted by Jerry Bates

- I found the responsibilities of “project manager” very challenging to navigate. It was difficult for me to determine exactly what that meant, although the team told me it meant keeping the project going to make sure we met our deadlines and encouraging everybody. Serving as the point person communicating with our client was another challenge. When a team member was working on a particular portion of the project, I felt it was more straightforward for the individual to discuss this directly with Dr. Bresica, and then report back to the rest of us. For the most part, I think this worked rather well. Lessons learned? It is important to have a clear outline of responsibilities or some established method for negotiating them in real time. Perhaps the experience of this course will help inform that future experience.



- Having some method of keeping track of where you are in the overall scheme of product development is very important. At the beginning of the course, I spent time reviewing the resources Dr. Grant shared, and trying to get the project management tools in ZOHIO set up. While we used the forum feature and tried posting documents to share, those aspects never seemed to “click”... they were more of an exercise than actually facilitating the work. Lessons learned? Get more practice using the tools you need before you actually have to press them into service. Be wary of trying to fit your project process into some abstract structure that you do not adequately understand.
- When faced with having to come up with a budget for the project, I personally had no idea how much time anything would take. So having to create a labor budget for the project plan was an exercise in fiction. Was it worth writing that short story? The value really was not obvious until the time came to compare our actual time to the estimated time. Curiously, we came in under budget in terms of time, although it certainly felt to me as if it was taking much much longer.
- The database I created to keep track of my time turned out to be a very useful tool for me. If I were to use it for another project, though, I would make sure the time categories fit the project rather than adopting somebody else’s schema for the classification system. At the start of the project, though, I had no good idea of what categories would be useful, so using somebody else’s idea was a starting place. Lessons learned? Continue to finetune a time keeping tool but keep it aligned with reporting categories (i.e., estimated time categories in the budget document).
- Spending time learning how to create a site style sheet is well worth the investment. While we put together different storyboards and visual templates, it wasn’t until we had our database connection working that we could flesh out the web pages. This was very late in the game, and using a site-wide stylesheet helped with that process. Next time? Invest time in designing the interface elements and use dummy content so you can get feedback from stakeholders.
- When our team started this project, I was the only one who had not created a survey with SurveyMonkey. So when the time came to collect process perspectives for this evaluation report, I was eager to catch up to my team mates. It did not take long to get a survey posted, and the “analysis” feature was very useful. We used a Likert-style scale. I discovered that the values stored for the responses were in the order of the answers. So, since we put “strongly agree” as the first response, that answer was stored as a “1”. If I were to do it again, I would reverse the response categories so the most favorable response would have the highest value. I wanted to chart the mean results, with highest value representing most favorable response. Next time, I’ll know better.
- I felt our team took a leap of faith when we selected this particular project. I was eager to learn how to create a web interface for a database, knowing full well that I had no skill in this area. Unrealistically, I thought I could learn how by shadowing our team expert. Time pressures made that impossible, as we had to be working on other parts of the project as those pieces were being developed. There were times when I questioned whether we would be able to deliver. But I learned that people have an incredible capacity to push ahead and learn new things in the face of very tight deadlines. So despite sometimes thinking we had been foolish to choose this project, I am proud that we accomplished what we did.
- This was my first exposure to the “rapid prototyping” approach, so using an approach I was not familiar with was an adventure. Next time? Do not be afraid to share the intermediate products with stakeholders, and engage them in conversations about where you are.
- Another “first” was the creating a performance support system. Up to this point, my projects have been instruction in a knowledge-based domain. Many of the protocols used in those projects were redefined for this project. Lesson? There are variations on the theme of “instructional design.” Being successful in this field means being open to new procedures and being able to transfer and adapt your skill set to new situations.



Project Evaluation Report Appendix

Process Perspectives Survey Responses

Response scale: 1=Strongly Agree, 2=Agree, 3=Neutral, 4=Disagree, 5=Strongly Disagree

Category/Question	TEAM	TEAM	TEAM	CLIENT	EXPERT	INSTRUC TOR	Mean
Instructional Design							
The product met the original proposal expectations.	1	1	2	2	2	1	1.67
The product met the terms of the proposal outlined in the team's project charter.	1	1	1	1	2	1	1.33
The design process successfully identified the essential element(s) for this performance support system.	1	1	2	2	2	1	1.67
The ePharm website follows a logical order.	1	2	1	1	1	1	1.17
The ePharm content is at a level appropriate for the end user.	1	1	1	1	2	1	1.17
The database management job aid follows a logical progression.	1	2	1	1	2	2	1.50
The database management job aid adequately addresses the need for which it was requested.	1	2	1	1	2	2	1.50
						Category:	1.43
Development Process							
Rapid prototyping was an effective process for developing this project.	1	2	2	1	2	1	1.50
The Open JAR team effectively utilized the rapid prototyping process.	1	2	3	1	3	2	2.00
I had adequate opportunity to provide feedback to the product during the development phase.	1	2	2	2	2	1	1.67
Changes to the product were implemented in a timely manner.	1	2	2	1	2	1	1.50
Product revisions appropriately reflect formative evaluation findings.	1	1	1	2	1	2	1.33
						Category:	1.60
Project Management: Communication							
Overall, communication with me was conducted in a timely manner.	1	2	2	2	2	1	1.67



Category/Question	TEAM	TEAM	TEAM	CLIENT	EXPERT	INSTRUC TOR	Mean
Overall, communication with me contained the information I needed.	1	2	2	1	2	1	1.50
I believe my input to the project was given careful consideration.	2	2	1	1	1	1	1.33
From my perspective, the right type of communication (email, face to face meeting, phone) happened at the right time.	1	2		2	2	2	1.80
						Category:	1.58
Project Management: Roles and Responsibilities							
I was able to contribute my knowledge and skills to the development of the product.	3	2	1	1	2	2	1.83
I knew what was expected of me during the development process.	1	1	2	1	2	2	1.50
						Category:	1.67
Project Management: Time Management							
The project's intermediate deadlines were met.	1	2	2	1	3	2	1.83
The project's final deadline was met.	1	1	1	1	2	2	1.33
The timeline outlined in the project plan was appropriate for a project of this scope.	1	2	4	2	3	2	2.33
The timeline outlined in the project plan was realistic.	1	2	4	2	3	3	2.50
						Category:	2.00



► Analysis Report

Prepared by Angela Macklin

Context Analysis

The health of society is a concern for any nation. The World Health Organization (WHO) defines health as a "resource for everyday life, not the objective of living", and "health is a positive concept emphasizing social and personal resources, as well as physical capacities" (Wikipedia, 2008). One aspect of improving human health is through clinical care. In the health profession, a wide variety of individuals are involved in this process. Each individual must communicate effectively with the other. The correct pronunciation of terms becomes a must.

The University of Tennessee's College of Medicine program is dedicated toward educating and training physicians at the undergraduate, graduate and postgraduate levels. The University of Tennessee, College of Medicine is part of the University of Tennessee's Health Science Center (UTHSC) and offers programs leading to the Doctor of Medicine (M.D.) degree. The College of Medicine also participates in the Doctor of Medicine (M.D.)/Doctor of Philosophy (Ph.D.) combined degree program. Medical Students rotate on campuses in Memphis, Knoxville, and Chattanooga as well as other training areas throughout the state. Over 900 residents train in participating hospitals located in Chattanooga, Jackson, Knoxville, Memphis and Nashville. Students at UTHSC are exposed to "a broad array of programs" (UTHCS web site, 2008).

In the second year of the program, medical students at UTHSC take a Medical Pharmacology course where they are expected to learn the names and uses of drugs. Course lectures and support materials present the drugs in categories according to usage and include the generic name, brand names, as well as correct spelling. In addition to learning the names and uses of drugs, it is important students learn the correct American English pronunciation, in order to communicate with other medical professionals they meet in a clinical setting. Students currently learn to pronounce the names of the drugs through hearing them spoken by the professors and through replaying lectures on tape. The current methods are not always adequate, as students provide anecdotal evidence of clinical incidents where they refer to a drug by name and are not understood by medical staff. Approximately eighty-five percent of the time students mispronounce terms by omitting



syllables or letters. According to Dr. Brescia, Instructional Technology Director, one reported source of the problem is a pronunciation difference between American and British English: the main lecturer speaks British English. Students thus need to learn to pronounce the drug names correctly in American English.

Salient issues include faculty support, student's grasp of word structure, student's ability to read and pronounce terms, and the student's prior knowledge of terms. Students are expected to recall over 600 drug names. The drug names are presented to students through lectures, recordings, or printed material. The primary stakeholders are the students, Director of Instructional Technology, and course directors of medical education.

Learner Analysis

Learner Description

Each year a hundred and fifty students enter the medical program. These students are typically residents of Tennessee, Mississippi, Arkansas, Kentucky, Virginia, North Carolina, Georgia, or Alabama. Ten percent may be from other states provided they are children of alumni. Prior to admission, students must complete ninety hours of undergraduate coursework, pass Medical College Admissions Test (MCAT), submit personal statement, and have desired personal qualities. Although no specific major is required, it is recommended that students take courses in humanities, fine arts, and social sciences. They need courses such as biology, chemistry, organic chemistry, general physics, and English.

Forty-seven students were surveyed. Sixty-eight percent agree that an online drug pronunciation guide would help them. The client also feels that the guide is necessary since studies show that students who study alone always have trouble. The students would be able to access the system from anywhere at anytime which would be ideal for the eighty percent who prefer to study alone. Although students may have personal computers, UTHSC provides access to computers.

**The Learner Analysis may be revisited at a later time as more information is gathered due to the low response from the surveys (Information was gathered from UTHSC web site, surveys, and the Instructional Technology Director).

Learner Expectations

Learners have a strong desire to become doctors which is evident by their enrollment at UT. From this knowledge, it can be inferred that they will be motivated to learn the correct pronunciation of terms. Being able to pronounce terms correctly reflects how well they are able to communicate with colleagues and others within the medical profession.

Performance Analysis

The desired performance is students will pronounce terms using Standard English on the first attempt.

The actual performance is approximately eighty-five percent of the time students mispronounce terms by omitting syllables or letters.



Possible causes for this discrepancy are:

- How instruction is presented (information, knowledge)
- Lack of resources available (information, resources)
- Difference between American and British pronunciation of terms (knowledge)
- Lack of practice in pronouncing terms (motivation)
- Lack of use of pharmacology terms (knowledge)
- Lack of knowledge of pharmacology terms (information, knowledge)

This proposal will address the lack of resources.

Purpose

A Web-based performance support system (WbPSS) will present the learner with an audio model of the correct pronunciation of terms.

Learning Context Analysis

Information

Categories	Data Sources	Learning Site Characteristics
1. Number/ nature of sites	Interviews: Director; UTHSC web site Site Visits Observations	<ul style="list-style-type: none">• Number: The UTHS program is located on campuses in Memphis, Knoxville, and Chattanooga.• Facilities: The Web-based delivery/deployment at UTHSC networks across campus and is delivered directly into the UTHSC student's home or computers on campus. Students may also obtain the connection on laptops through wireless capabilities.



Information

Categories Data Sources Learning Site Characteristics

<p>2. Site compatibility with instructional needs</p>	<p>Interviews: Director, UTHSC web site, Learners Site Visits Observations</p>	<ul style="list-style-type: none"> ● Equipment: Most locations are equipped with computers that have the latest and productive computing capabilities as well as printers; others may contain scanners. ● Resources: An account for technology and programs created from State funds and tuition will go towards the development of the system. ● Constraints: <ol style="list-style-type: none"> 1. Since medical students are very busy, obtaining participants to go through the web-based performance support system may be difficult. 2. Meeting and training rooms in the library have to be scheduled for individual use. Scheduling and arranging an area within the library or student center within timeframe may present a problem. 3. Students using the web-based performance support system at the same time may disturb each other. ● Instructional strategies: Instructional strategies may include but are not limited to self-study print material, computer-based instruction, classroom group discussion sessions in library or other designated area. The web is a means to provide materials and discussions in a collected location. With the aid of the WbPSS, students on rotation or residency will have access to these discussions and materials. Novice and expert users will find the EPSS beneficial to either. ● Delivery approaches: The ITS department provides support to faculty and students regarding technical issues and services; resource handbook outlines all services provide. ● Time: Student determines amount of time needed to review material. ● Personnel: UTHSC has a Department for Information Technology Service (Computing Systems, Oracle Application Development, Networking Services, Technology Support Services, and Telecommunications) along with the and staff of the College of Medicine on each of the campuses.
<p>3. Site compatibility with learner needs:</p>	<p>Interviews: Director, UTHSC web site Learners Site Visits Observations</p>	<ul style="list-style-type: none"> ● Location (distance): The sites are located in an area in or near downtown. ● Conveniences: The centers are near restaurants and have cafeterias in the facility. ● Space: Individual or groups (large or small) can meet. ● Equipment: Users may bring laptops or use any computer within the center.
<p>4. Feasibility for simulating work place</p>	<p>Interviews: Director, UTHSC web site Learners Site Visits Observations</p>	<ul style="list-style-type: none"> ● Supervisory characteristics: Instructors are available to assist students. ● Physical characteristics: The physical characteristics may be simulated since students often communicate with each other in study groups around campus. ● Social characteristics: The students will be able to communicate with each other.



Topical Analysis

After several conversations with the client, the following list of drug names have been identified as the preferred list of drugs. These are the Autonomic drugs that students are to know. The drug list was on the tape with the M3 student wearing a blue blouse.

DRUGS ACTING ON AMINE SYNTHESIS, UPTAKE OR METABOLISM

alpha-methyl dopa (Aldomet)
Carbidopa (Lodosyn)
Cocaine
Disulfiram (Antabuse)
Entacapone (Comtan)
Metyrosine (Demser)
Phenelzine (Nardil)
Reserpine (Serpasil)
Selegiline (Eldepryl)
Tolcapone (Tasmar)
Tranylcypromine (Parnate)
Tricyclic Antidepressants (TCA) e.g.
Desipramine or Amitriptyline

DIRECT SYMPATHOMIMETICS

Albuterol (Proventil)
Bitolterol (Tornadate)
Clonidine (Catapres)
Dobutamine (Dobutrex)
Epinephrine
Formoterol (Foradil)
Guanabenz (Wytensin)
Isoproterenol (Isuprel)
Metaproterenol (Alupent)
Methoxamine (Vasoxyl)
Norepinephrine (Levarterenol)
Phenylephrine (Neo-synephrine)
Pirbuterol (Maxidair)
Ritodrine (Yutopar)
Salmeterol (Serevent)
Terbutaline (Brethin)

INDIRECT SYMPATHOMIMETICS

Amphetamine
Ephedrine (Pretz-D)
Metaraminol (Aramine)
Tyramine

ALPHA-ADRENERGIC ANTAGONISTS

Doxazosin (Cardura)
Phenoxybenzamine (Dibenzyline)
Phentolamine (Regitine)
Prazosin (Minipress)
Terazosin (Hytrin)

BETA-ADRENERGIC ANTAGONISTS

Acebutolol (Sectral)
Atenolol (Tenormin)
Carvedilol (Coreg)
Esmolol (Breviblock)
Labetalol (Trandate)
Metoprolol (Lopressor)
Nadolol (Corgard)
Penbutalol (Levatol)
Pindolol (Visken)
Propranolol (Inderal)
Sotalol (Betapace)
Timolol (Blocadren)

D1/D2 AGONISTS

Apomorphine (Apokyn)
Dopamine (Inotropin)
Pergolide (Peremax)

D1 AGONISTS

Fenoldopam (Corlopan)

D2 AGONISTS

Bromocriptine (Parlodel)
Pramipexole (Mirapex)

D1/D2 ANTAGONISTS

Haloperidol (Haldol)

D2 ANTAGONISTS

Domperidone (Motilium)

INHIBITORS OF Ach RELEASE

Botulinus Toxin

MUSCARINIC AGONISTS

Acetylcholine (Miochol-E)
Bethanechol (Urecholine)
Carbachol (Isocarbachol)

Cevimeline (Evoxac)
Methacholine (Provocholine)
Pilocarpine

MUSCARINIC ANTAGONISTS

Atropine
Benztropine (Cogentin)
Glycopyrrolate (Robinul)
Ipratropium (Atrovent)
Oxybutynin (Ditropan)
Scopolamine (Isopto)
Trihexphenidyl HCl (Artane)
Tropicamide (Mydracil)

GANGLIONIC AGONISTS

Acetylcholine
Nicotine

GANGLIONIC ANTAGONISTS

Hexamethonium
Mecamylamine (Inversine)

NON-DEPZ NM-BLOCKERS

Atracurium (Tracrium)
D-Tubocurarine (Curare)
Mivacurium (Mivacron)
Pancuronium (Pavulon)
Rocuronium (Zemuron)
Vecuronium (Norcuron)

DEPZ NM-BLOCKERS

Succinylcholine (Anectine)

ANTI-CHOLINESTERASE

Echothiophate (Phospholine)
Edrophonium (Tensilon)
Neostigmine (Prostigmin)
Physostigmine (Eserine)
Pyridostigmine (Mestinon)

CHOLINESTERASE RE-ACTIVATORS

Pralidoxime (2-PAM)



► Treatment Report

The electronic performance support system's initial treatment plan was supplanted by the product specifications and high concept statement, which follow.

Product Specifications

The required product is a database of generic drug names, categories, subcategories, descriptions, brand names, phonetic spellings, and audio pronunciations. The database must be accessible to the users through a Web interface, which is neither platform nor browser dependent. The user must be able to access a drug name by its category and play an audio pronunciation of the generic name for the drug.

The product must be initially populated with 90 drug names, must support expansion to a comprehensive list of drugs, and must be able to accommodate video clips (provided by UTHSC) which UTHSC plans to add at a later date. At present, 700 drugs comprise the comprehensive list.

Audio files for the pronunciations may be derived from video files provided by UTHSC, retrieved from authoritative external sources, or recorded by new subject matter experts.

The site must be designed to conform to and use the UTHSC Medical Library server specifications: OS X (10.4), 250 GB storage, 2GB RAM, php 5.0 (minimum), MySQL 5.1 (minimum), SQLite 3.0 (minimum), support for SSH/SFTP, 10/100/1000 ethernet adapter, and Linux based system. The system will be hosted by the UTHSC Library and will not require a user login. However, access to the UTHSC Library system is restricted through a separate login authentication to College of Medicine students, faculty, and administrators. System maintenance documentation must be included with the product to delineate how to add, change, and delete database entries.



High Concept Statement

ePharmacology is an on-demand Web-based system supporting medical students as they learn to pronounce the names of pharmaceuticals in their Medical Pharmacology course. Students use an audio icon to play the model pronunciation of the drug name they have selected from a categorized list.

Hosted at the client's site, the menu-driven product uses a database to store both the generic and brand names of drugs and audio pronunciation files. The database accommodates a multi-layered categorical system so descriptive information is displayed together with the drug selected by the user.

The system initially houses 90 autonomic drugs from 19 categories, but this number can be expanded without limit. The system can also be expanded by the users to include video clips.

A streamlined user interface uses a simple two-column layout. From the left column, students select the name of a drug from the master list. The right column then provides details of the selected pharmaceutical together with the accompanying audio pronunciation file.

An included user-friendly job aid for the database manager delineates the steps needed to add, edit, and discontinue existing records.

Description of the Site and Rationale

The website (<http://library.utmem.edu/ePharm>) is composed of 4 html pages, and one frameset containing 2 separate frames. Each page displays the same banner. The banner identifies the product name and includes the UTHSC logo (directly from the UTHSC website). This logo is an active link to the utmem.edu website. The bottom of each page is bounded by a color footer which identifies the solution developer and date (OpenJAR Solutions, 2008). The 4 pages are:

1. Introduction
2. Illustrated Guide
3. ePharm (active content)
4. Resources

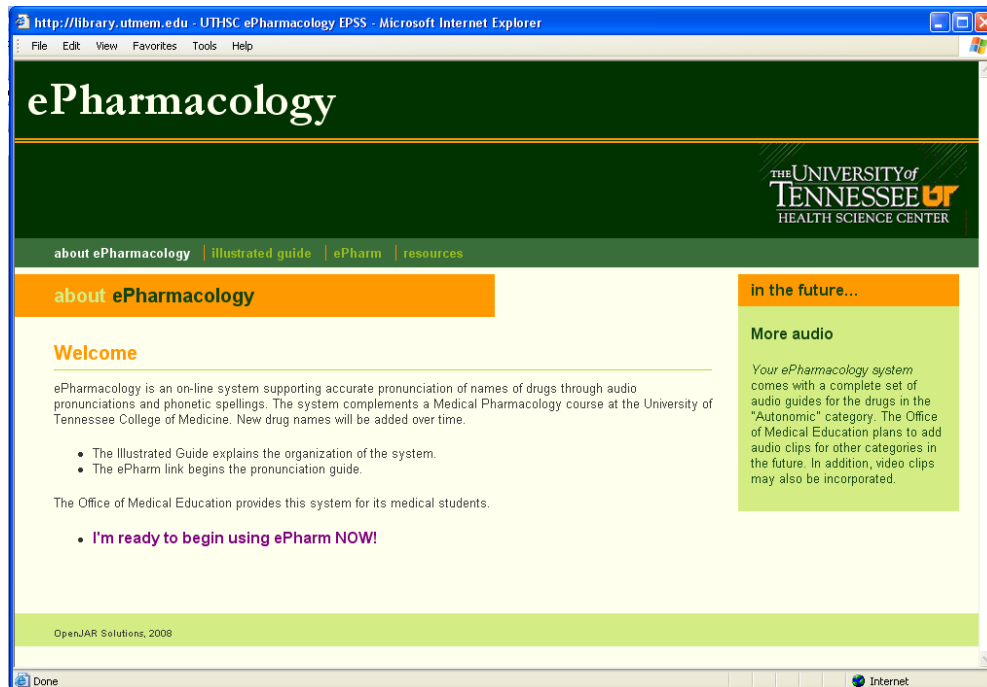
Progression is non-linear, based on user selection of pages. Users select pages using a horizontal navigation bar that appears directly under the banner. The navigation bar appears on each page, in the same location. The main content page is constructed using frames, with the content in the frames generated via php script.



Interface(s)

About ePharmacology

The “about ePharmacology” page (index.htm) is the first link in the navigation bar. This page contains a welcome message, a changeable message box on the right side of the screen, and a link to go directly to the ePharm page.



Illustrated Guide

The “illustrated guide” page (guide.htm) is the second link in the navigation bar. This page contains a screen image of the main content page together with brief instructions for using the system. The guide page also includes a link for downloading a one-page pdf document presenting the illustrated guide together with callouts marking salient points. The downloadable guide advises the user that the plug-ins needed for the system can be downloaded free from the Internet. Finally, the guide page includes a link to the ePharm page. This is particularly useful for the user who is not yet familiar with the navigation bar.

http://library.utmem.edu - UTHSC: ePharmacology EPSS | Illustrated Guide - Microsoft Internet Explorer

File Edit View Favorites Tools Help


ePharmacology

THE UNIVERSITY of TENNESSEE **UT** HEALTH SCIENCE CENTER


about ePharmacology | **illustrated guide** | ePharm | resources

illustrated Guide

Using ePharmacology

- **I'm ready to begin using ePharm NOW!**
- **I want to download a pdf  copy of the Illustrated Guide.**

Drug names are listed in categories used by the Medical Pharmacology course. Categories are in the large print in the left window. (Contact the Office of Medical Education about adding new drugs and categories.)


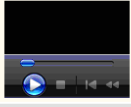
- To **display drug information** in the Drug Information window, scroll through the list in the left window. Then click on the drug's name in the list.
- To **hear the drug name pronounced**, click (or double-click) on the audio control in the drug's information window. The audio control looks like this: . To **replay**, click the audio control again.
- To **resize the drug list**, let the mouse pointer hover over the right edge of the scroll bar, until the pointer changes to a double-arrow. Then click and drag the border to the right or to the left.
- To **listen to a different drug name**, select the drug name in the list on the left. After its information appears in the right window, click its audio control.

When you are finished, simply close your browser.

Autonomic

- [Acebutolol](#)
- [Acetylcholine](#)
- [Acetylcholine](#)
- [Albuterol](#)
- [alpha-methyl dopa](#)
- [Amiripryline](#)
- [Amphetamine](#)
- [Apomorphine](#)
- [Atenolol](#)
- [Atracurium](#)
- [Atropine](#)
- [Benztropine](#)
- [Bethanechol](#)
- [Bitolterol](#)
- [Botulinic Toxin](#)

Drug Information

Drug Name	Acetylcholine	(a se teel KOE leen) 
Category	Autonomic	
Area	Muscarinic Agonists	
Sub-Area		
Brand Name(s)	Miochol-E	
Video		

OpenJAR Solutions, 2008

Internet



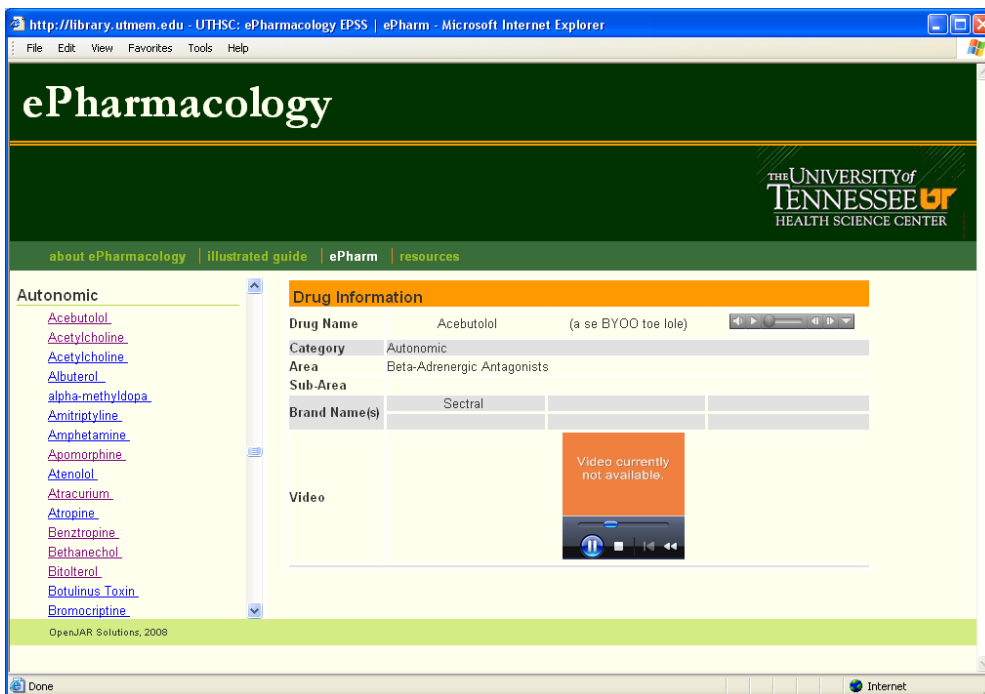
ePharm (main content)

The “ePharm” page (epharm.htm) is the third link in the navigation bar. (Links to this page are also located in the body of the index and the guide pages.) The ePharm page is the main content page.

The “ePharm” page inserts an inline frameset immediately following the horizontal navigation bar. The frameset contains two frames, each with a php database connection with mySQL (e.g., http://library.utmem.edu/epharm/epharm_content.php).

The content in the left frame is drawn from the category table in the database. Indented beneath each category in the left frame are hyperlinked names of drugs belonging to the category. The hyperlinked drug names in the left frame activate the content for the right frame.

The right frame displays content in a drug information table. This table contains the following: (a) drug name; (b) simulated phonetic spelling of drug name; (c) audio control; (d) name of category; (e) name of treatment area; (f) name of sub-treatment area; (g) multiple brand names; and (h) video control. The audio control is a Quicktime or Media Player control (depending on client browser plug-in) which links to the address of the audio file connected to the selected drug. The link may be either internal to the host system or external. The video control links to the address of the video file. As delivered, all video control links display the same place-holder, a Flash video which informs the user that “Video [is] currently not available.”

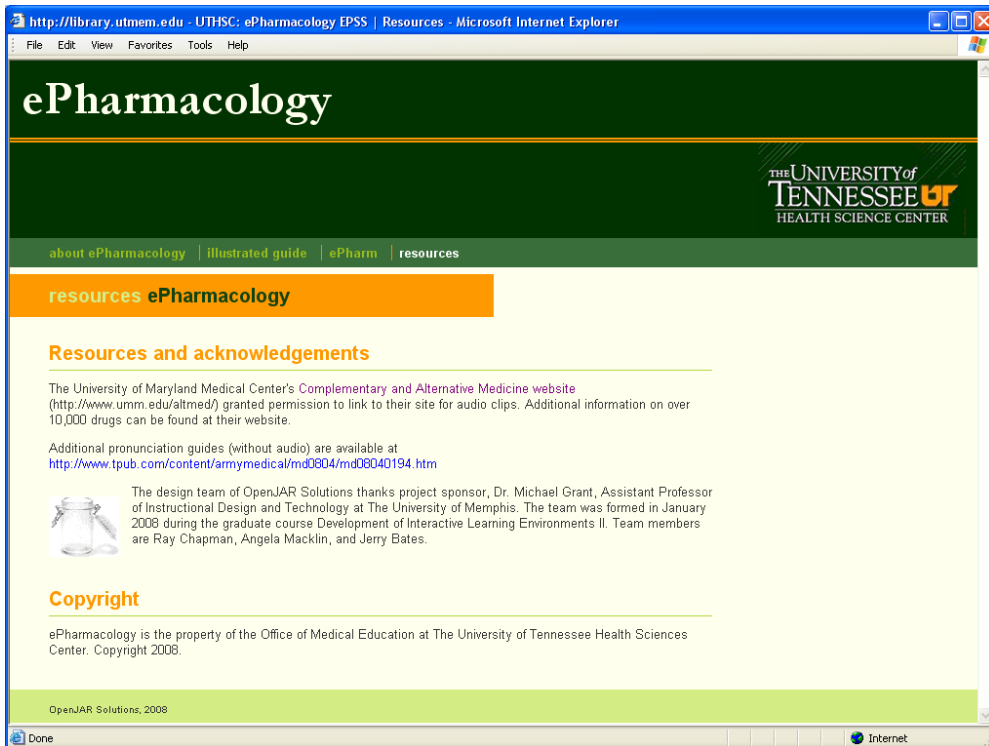


The screenshot shows a web browser window displaying the ePharmacology website. The page has a green header with the title "ePharmacology" and the logo for "THE UNIVERSITY of TENNESSEE HEALTH SCIENCE CENTER". Below the header is a navigation bar with links: "about ePharmacology", "illustrated guide", "ePharm", and "resources". The main content area is divided into two frames. The left frame, titled "Autonomic", contains a list of hyperlinked drug names: Acebutolol, Acetylcholine, Acetylcholine, Albuterol, alpha-methylidopa, Amitriptyline, Amphetamine, Apomorphine, Atenolol, Atracurium, Atropine, Benztropine, Bethanechol, Bitolterol, Botulinus Toxin, and Bromocriptine. The right frame, titled "Drug Information", displays details for the selected drug, Acebutolol. The information includes: Drug Name: Acebutolol (a se BYOO toe lole); Category: Autonomic; Area: Beta-Adrenergic Antagonists; Sub-Area: ; Brand Name(s): Sactal; and Video: Video currently not available. The video placeholder is a small orange box with a play button icon and the text "Video currently not available." The browser's status bar at the bottom shows "Done" and "Internet".



Resources

The “resources” page (resources.htm) is the fourth link in the navigation bar. This page identifies and acknowledges two content sources, one of which is the audio source. The sponsor of the project team and the names of the team members of the solution provider are identified. The page concludes with a copyright notice.



Templates, Sitemap, and Style Sheet

A template was not employed for this product. Instead, an external style sheet (css) was created. Page divisions defined in the study sheet were the masthead, a horizontal navigation bar, main content, and sidebar area, a callout text box, and a footer area. Refer to the Technical Appendix for copies of the style sheet and php code. The site map for the ePharm product is shown in Figure 2.

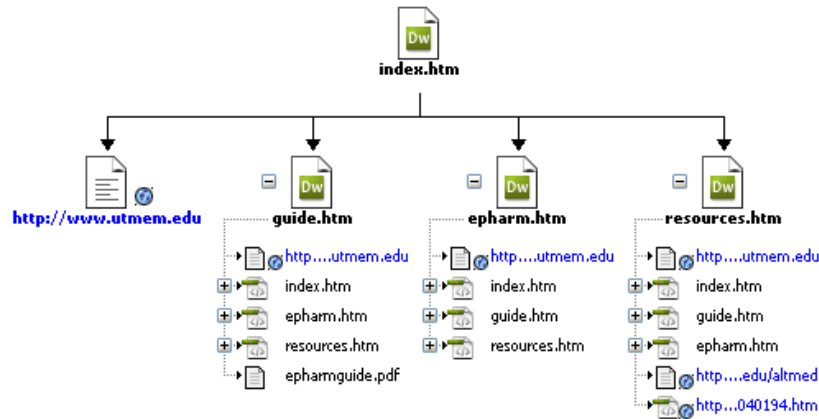


Figure 2: ePharm site map

Planning Documents

Initial storyboards were emailed to the client on February 22, 2008, who provided positive feedback, indicating this was more than he had anticipated. According to this initial plan, the user would select a drug category from a list. Then the list of drugs belonging to that category would be displayed. From the list of drugs, the user would select a drug and then view the information and have access to the audio control. The original storyboards are presented in a separate pdf document.

As database development progressed, the team was found the original model was not conducive to the database design. As a result, the model was revised. A reference table at the top of the screen presented the drug category list used to identify the category's 3-digit prefix. The left lower portion of the screen presented drug names, each with its identifying 6-digit drug number. Users were to match the first 3 digits of the drug number with the category number, thereby identifying the drugs belonging to the category. Scrolling through the list, the user would use the drug name's hyperlink to retrieve information from the database which was displayed on the right side of the screen. Selecting a different drug name would refresh the display with new data. A new storyboard representing the new presentation model was drafted March 18 using PowerPoint. Illustrating the basic four page concept that was ultimately used, prototype two actually required multiple pages to explain the complicated method of locating drugs belonging to a particular category. The second set of layouts is presented in a separate pdf document. Since this method was considered unduly awkward, requiring far too much user action to retrieve the information, the design team determined to find a more



user-friendly presentation method. This second prototype was therefore not presented to the client, as the team knew it would not fairly represent what it hoped it would ultimately deliver.

Following additional investigation regarding database access and presentation, the model represented in the second iteration was revised utilizing an inline frameset model. This simplified approach presented the complete list of categorized drugs in the left frame. Selecting a drug's hyperlinked name from the list populated the drug information table on the right. This revision meant users did not need to refer to a category table or match a drug number with a category number. Once this third model for the core page was tested, the production of the remainder of the web pages proceeded using this design. The third iteration of design documents was produced March 30 in xhtml, after the cascading style sheet (css) was established. The client, who was provided with a link to this third prototype on April 2, responded favorably to this final design. This version was used for the formative evaluation which commenced with e-Learning expert reviews on April 3.

The fourth design revised the third prototype based on findings from the e-Learning experts, as discussed in the Formative Evaluation Report. The interface screens presented earlier in this report represent this final iteration. The css content and the php code for this fourth iteration are available in the Technical Appendix.



► Formative Evaluation Report

Overview

A web-based performance support system for second year medical students was designed and created specifically for the Office of Medical Education at the University of Tennessee Health Sciences Center. The system provided users with on-demand access to clearly audible pronunciation models for a series of generic drug names presented according to specified categories of pharmaceuticals. The core product was composed of four web pages: an introduction, an illustrated guide, the database presentation page, and a resources page. The database page offered the user a list of drugs according to categories. When a drug was selected from the list, its name and an audio control were presented on the right side of the screen.

The formative evaluation of the product collected data at key points during the final stages of the development process. These data were used to improve the product before its final release to the client.

The primary objective in the evaluation was to determine product usability. However, it was also of interest to determine the extent to which users expected to find the product supportive of their efforts to correctly pronounce a specified set of drug names. While the ultimate objective of the owners of the performance system was to have students use it to enhance their pronunciation skills, the extent to which users master such skills was explicitly outside the scope of this evaluation.

Based on the evaluation objectives, the following questions informed the evaluation.

1. Did the system operate as designed? That is,
 - Did the initial splash screen appear in the browser window of the user's choice?
 - Were the links from one page to another functional?
 - Did the system support user selection of a specified drug category?
 - Did the drug categories and drug names cleanly load from the backend database to the front end interface?
 - When a user selected a specified category, did the system present the list of drugs that belonged to that category?



- Did the system permit the user to select any drug within the specified category?
 - Did the system legibly present drug information, including applicable brand names and phonetic pronunciation guide for the generic name about the selected drug?
 - Did the system operate without error?
2. Could typical users utilize the system for its intended purposes?
 - Did the system provide the user with an onscreen method to play an audio pronunciation of the specified drug?
 - Did the audio files play on the user's system?
 - Was the system successful in permitting the user to play a given audio file repeatedly?
 - Was the audio audible to the user?
 - Did the system permit the user to select a different drug from the same category, without having to restart the system?
 - Was the interface intuitive enough so that users navigate the system without needing outside assistance?
 - Did users experience any confusion in how to use the system?
 - Did the system permit users to recover gracefully from user error?
 - What user errors occurred during system use?
 3. To what extent did the users believe the system will support their efforts to learn to correctly pronounce the names of drugs?

The evaluation was conducted in the following successive phases: (1) expert usability review by eLearning experts (heuristic approach); (2) one-on-one learner testing of usability; (3) small group learner testing of usability. The e-Learning expert reviews occurred April 3-4, 2008. These results were summarized by the project manager. The three one-on-one reviews took place April 9-10, 2008. The five small group reviews were conducted April 11, 2008. Both the one-on-one and small group review results were summarized by the data collector.

Design

Phase 1: Expert usability review by eLearning experts using a heuristic approach

To identify any problems with the usability of the product before it was introduced to the intended users, a heuristic evaluation was undertaken as the initial phase in the formative evaluation. Two eLearning experts, professors of instructional design and technology at The University of Memphis, were invited and agreed to critically examine the system's interface in terms of its usability.

Instrument. A three-part evaluation instrument was designed for this purpose, based on Neilson's "Ten Usability Heuristics" (Neilson, nd. b). The first section of the instrument asked testers to document test conditions (platform, OS, browser, date, and duration). The second section of the instrument was divided into five dimensions derived from Neilson's principles. This section contained a total of 20 items to be scored using a 5-point Likert scale (1=Strongly Disagree to 5=Strongly Agree). Each individual dimension was assigned from 2 to 7 separate rating items plus a single open-ended response item. The third section was used to collect tester comments and ratings of additional issues not otherwise addressed in the response form. The tester was asked to (a) briefly describe the issue, (b) specify where it was encountered, and then (c) rate it in terms of severity and extensiveness. A 3-point scale was used for each rating, using the following scale values:



Severity (3=Critical; 2=Non-critical but attention recommended; 1=Fix if time permits) and Extensiveness (3=Occurs in 3 or more places; 2=occurs twice; 1=Occurs only once). A complete copy of the instrument (including transcribed results) is included in Appendix A.

Methodology. To evaluate the system, the URL for the system was emailed to the experts together with the evaluation instrument and a brief statement of the purpose of the system and its intended audience. The experts were asked to complete the evaluation within a 48-hour testing window and to return the completed instrument either electronically or in hard copy format. The experts were asked to test the system using whatever operating system or browser they chose. If they wished to test the product with multiple browsers or operating systems, they could do so, but were requested to annotate any differentiated results on the response instrument. The evaluations occurred on April 3 and 4, 2008, and both experts returned their review forms via e-mail.

Phase 2: Learning usability testing using one-on-one trials

The second phase of the formative evaluation was conducted using one-on-one trials, following revisions to the system based on the analysis of the eLearning expert review. This phase was important because the participants provided valuable information as they demonstrated the online performance support system. Their impressions of the online performance support system helped to make necessary changes to the system. By observing individuals go through the system, the developers could see the kinds of problems that occurred. The effectiveness of the system could be obtained from the observations as well.

Methodology. For the one-on-one evaluations, the second draft of the product was used. In each of the three trials, the participants were given a guide which indicated the purpose of the evaluation was to determine the usability of the system. The guide presented the URL for the system and listed 5 drugs which participants were to locate and play the audio pronunciation model. At the conclusion of the trial, each participant was asked to complete three Likert-style response items (strongly disagree to strongly agree) designed to ascertain the participant's perception of the usability and utility of the program.

Procuring participants. Despite the client's repeated efforts to procure volunteers for this and the next phase of the evaluation from among the medical student body, only two were obtained. The testing window unfortunately coincided with a month of study during which the third year medical students were preparing for their first Board exam, which meant these students were absolutely unavailable. Second year medical students were likewise engaged in intensive study, for their final exams. As a result, only first year medical students were potentially available. The client emailed this group of students and procured a total of two volunteers to participate in the test.

Since this was an insufficient number for conducting both the one-on-one and small group evaluations, it was decided to reserve these two volunteers for the final review process with the small group testing. The design team subsequently sought help from the project sponsor to identify a viable source for additional test subjects. Through the assistance of the Staff Development Educator in the Department of Nursing Education at St. Jude Children's Research Hospital, a volunteer roster of ten registered nurses was made available to the team. Angela Macklin contacted all volunteers by e-mail to set the evaluation schedule.

Actual participants. In the end, three participants similar to the target audience were used in the one-on-one trial. These participants were nurses from St. Jude. In their jobs, they regularly read doctors' prescriptions and administer medications to patients. They all had taken a Pharmacology course in nursing school.



Instrument. This evaluation collected data using an Observation Note Log and Participants Guide. (See Appendix B.) The Participant's Guide was comprised of a set of instructions, the list of target drug names, and a 3-item Likert-style attitude response section. Draft two of the system was used.

Phase 3: Learner usability testing using small group trials

The third phase of the formative evaluation was conducted using small group trials. The users for the third phase were identified in the manner described earlier.

Methodology. The same version of the product was used for the small group trials as was used with the one-on-one testing. Although this was not the ideal arrangement, it was necessary in order to capitalize on the availability of the volunteers. Since the revisions needed after the one-on-one testing were only minor, this compromise was deemed acceptable.

The small group trials were conducted in the same manner as the one-on-one trials. That is, they were conducted individually and observed by one of the design team. One of the tests was conducted in the UTHSC computer laboratory provided by the Director of Instructional Technology. The rest took place at St. Jude Children's Research Hospital. The observation protocol and testing guide were the same as those used for the one-on-one trials.

Participants. Five participants, one from the target audience and four from a similar group were used in the small group trial. The participants consisted of one M2 student and four nurses from St. Jude. The M2 student will be taking a Pharmacology course soon. The nurses have had a Pharmacology course.

Instrument. The same set of instruments used for one-on-one trials were used for the small group trials. See Appendix B.

Results

Phase 1 Results: Expert usability review by eLearning experts using a heuristic approach.

A complete transcription of results and comments is provided in Appendix A.

Context: Platform, OS version, and Browser: One expert used a computer with the Windows operating system and the Firefox browser (version 2.0.013). The other expert used a Macintosh computer (10.5 OS). This expert tested the product with two different browsers: Firefox versions 2 and 3beta, and Safari 3.1. The first expert did not report the total testing time, but the second expert reported the test took one hour.

Results from each of the five dimensions will be presented in turn. As shown in Figure 3, results were very supportive of the product. However, there were specific areas where revisions were recommended. These will be summarized in the following sections.



Dimensions (eLearning Experts)

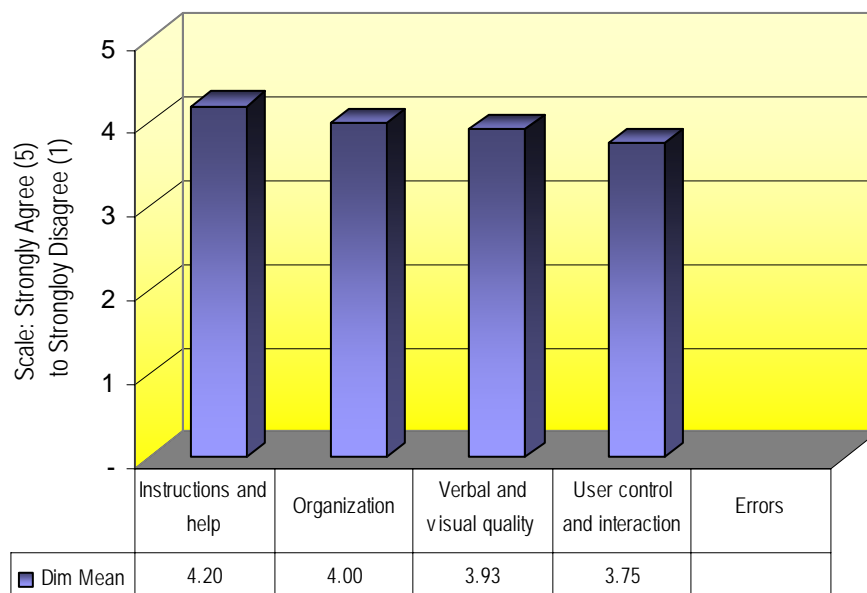


Figure 3: eLearning Expert review: Means for Dimensions

Dimension 1: User Control and Interaction

Results: The overall rating for user control and interaction was 3.75, with ability to exit and reasonable feedback time given the highest scores (M=4.5). Mean responses regarding appropriate feedback and shortcuts were 3.0 (neutral), although one respondent who marked “disagree” on shortcuts commented that while there were none, none were needed since the system only required a single click. One of the respondents indicated the audio player and pronunciation guide did not appear, even after checking “about 30” of the drug entries. The other respondent remarked that the video “took a bit too long to download and begin playing.” Item responses are indicated in Table 2.

Table 2: User Control and Interaction

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean*
The system gives the user control over the ability to exit from the system at any time	0%	0%	0%	50%	50%	4.5
Feedback is provided within a reasonable period of time	0%	0%	0%	50%	50%	4.5
The system provides users with appropriate feedback	0%	50%	0%	50%	0%	3.0
The system incorporates shortcuts that can cut down user navigation time	0%	50%	0%	50%	0%	3.0

*Scale: Strongly Disagree (1) to Strongly Agree (5)

Assessment of Results and Changes: A follow-up conversation with the tester who reported the audio did not play revealed the individual looked at drug names that were NOT in the Autonomic category. Since the system was designed to present audio and phonetic spellings for only the Autonomic category, this was not considered a performance issue. To avoid this potential confusion in the remaining tests, the database was abbreviated so that the Autonomic category of drugs was presented. The final decision regarding the



disposition of the “extra” drug names was referred to the client, who requested that the final product include all drug names. Thus, the complete database was subsequently added back to the product.

However, this problem did suggest issues with the usability of the instructions which clearly stated there were pronunciations and spellings available only for this specific group of drugs. As a result, the orientation language in two pages of the web site was streamlined, reducing the volume of text and adding emphasis via bulleted points. A downloadable copy of the Illustrated Guide was also added, with its link placed on the guide page, so the users might have a printed copy available for reference during their use of the product.

With respect to the video download time: the video clip was included only to demonstrate to the client that the system had reserved space for later inclusion of video, should the client desire to do so. This was not therefore considered an issue requiring attention.

Dimension 2: Verbal and Visual Quality

Results: The overall score for the seven items in the Verbal and Visual Quality dimension was 3.93. While respondents indicated the dialog covered the essentials, was written in real-world language, and used consistent language, one commented that the prose was clear, but “may need some tweaking.” The majority of the concern was with the visual elements, with only neutral to agree ratings on their internal consistency, and noncommittal response on the aesthetic quality. Indeed, considerable comments and suggestions were offered on this specific quality. Specifically: the font and table presentation of the database were outdated; the bottom of the window needed something to visually mark its boundary; and frame sizes needed adjusting. While the reviewer indicated corrections would be “quick and easy,” the fact that they should be made was indicated by the comment that the graphic design looked more like a school project than a client-worthy product. A summary of individual item responses is presented in Table 3.

Table 3: Verbal and visual quality

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean*
Dialog covers the essentials.	0%	0%	0%	50%	50%	4.50
The system does NOT present irrelevant information.	0%	0%	0%	50%	50%	4.50
The material is presented in real-world language	0%	0%	0%	100%	0%	4.00
Specialized knowledge of technology and databases is NOT required in order to use this system.	0%	0%	0%	100%	0%	4.00
The system is consistent in its use of language	0%	0%	0%	100%	0%	4.00
Visual elements in the system are internally consistent	0%	0%	50%	50%	0%	3.50
Visual elements are aesthetically pleasing	0%	0%	100%	0%	0%	3.00

*Scale: Strongly Disagree (1) to Strongly Agree (5)

Assessment of Results and Changes: Six modifications were made as a result of this section of findings: (1) The prose was “tweaked” throughout, as has already been indicated: made more straightforward and succinct, and bullets used to emphasize key points. (2) A colored footer was added to each of the web pages to signal “end of page.” (3) Font changes were made: the font in the drug table was changed to match the sans serif font in the rest of the web content, and the heading sizes were scaled down. (4) Table design was modernized by adding cell shading for alternating rows and changing the lines to white. (5) A colored line added emphasis to the category name in the drug list. (6) Frame size issues were addressed by decreasing the size of the category



headers, and giving users control over the width of the frames. This feature was also noted in the Illustrated Guide page.

Dimension 3: Errors

Results: Neither respondent replied to the two questions in this dimension (error messages are easily understood; users are able to recover from errors), and one commented these questions were not applicable. The other respondent indicated there was “not much chance for operator error” as you “just click on the drug.” He indicated he did not see any error message, “unless you count a Quicktime symbol instead of an audio player.” As noted earlier, this situation occurs when there is no audio available.

Assessment of Results and Changes: Appearance of the Quicktime symbol was not considered an error, as only a subset of drugs were to be presented in the product.

Dimension 4: Instructions and Help

Results: This dimension rated the highest score of the five areas of interest, with a mean score of 4.2 on a 5-point scale. Subjects either agreed or strongly agreed with each of the items: instructions and help were visible, readily available, provided when needed, concise and to the point, and the space devoted was proportional to the rest of the screen content. One subject observed “there’s not really a help system in this site. Instead, there are instructions, and they are clear.” A summary of individual item responses is presented in Table 4.

Table 4: Instructions and Help

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean*
Instructions are visible.	0%	0%	0%	50%	50%	4.50
Instructions are readily available.	0%	0%	0%	50%	50%	4.50
Help is provided when needed.	0%	0%	0%	100%	0%	4.00
When provided, help is concise and to the point.	0%	0%	0%	100%	0%	4.00
Space devoted to help is proportionate to the rest of the screen content.	0%	0%	0%	100%	0%	4.00

*Scale: Strongly Disagree (1) to Strongly Agree (5)

Assessment of Results and Changes: Despite the high rating in this section of the evaluation, other findings suggested that the instructions were not fully effective. That is, one of the two participants tried to “play” audio for drugs that were not in the designated category. As indicated earlier, the solution was to remove those additional categories from the system, since they were not part of the product deliverables.

Dimension 5: Organization

Results: Both eLearning experts agreed (M=4.0) that the structure was logical and the interface intuitive. Added comments indicate “based on my understanding, I think you have delivered what the client requested,” and “just fine. No problems.”

Table 5: Organization

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean*
The structure is logical.	0%	0%	0%	100%	0%	4.00
The interface is intuitive	0%	0%	0%	100%	0%	4.00

*Scale: Strongly Disagree (1) to Strongly Agree (5)

Assessment of Results and Changes: Based on these results, no changes were deemed needed.



Summary of comments by dimension

Comments on user control and interaction:

- Video took a bit too long to download and begin playing.
- Tried firefox 2, firefox 3 beta, and safari, all on Mac OS X 10.5.
- In all 3 browsers the audio files (audio player) did not appear, and the phonetic pronunciation guide did not appear. I also saw no video connected with any of the drug choices I made, and I checked about 30.

Comments on verbal and visual quality:

- The database generated information (under the middle two tabs) looks 1997-ish. I suggest sans-serif fonts and a “cleaner, more modern looking” table/cells.
- Consider a footer, band of color, or something to signify the bottom of the window. I always feel like I have to do some scrolling (and I don’t) on the 2 database pages.
- The size of the left frame of the ePharm page should be reduced and the headings better formatted. This frame is creating lots of empty space and putting too much distance between the list and the database generated information (table).
- Overall, from a graphic design standpoint I think this looks like something to be submitted as a (really good) school project rather than something to be presented to a client. However, I think the edits are quick and easy.
- Some of the prose may need some tweaking. It’s clear though.

Comments on errors:

- Not applicable
- Didn’t see any error messages, unless you count a quicktime symbol instead of an audio player.
- Not much chance for operator error. Just click on the drug.

Comments on Instructions and help:

- NA = not applicable (This was noted for “When provided, help is concise and to the point” and “Space devoted to help is proportionate to the rest of the screen content.”)
- There’s not really a help system in this site. Instead, there are instructions, and they are clear.

Comments on Organization:

- Based on my understanding, I think you have delivered what the client requested.
- Just fine. No problems.

Phase 2 Results: Learning usability testing using one-on-one trials

Context. Phase 2 testing took place on the campus of St. Jude Children’s Research Hospital on April 9-10, 2008. One team member scheduled and observed the trials, using the observation protocol provided in Appendix B. Each test took from three to seven minutes, from the time the participant keyed in the web address to the time the fifth drug audio file was played. All three subjects used a Windows platform computer; two browsers were used: Firefox and Internet Explorer.

Phase 2 of the evaluation was important because the participants provided valuable information as they demonstrated the use of the online performance support system. Their impressions of the online performance support system helped to inform necessary changes to the system. By observing individuals go



through the system, the developers saw the kinds of problems which occur. The effectiveness of the system could be obtained from the observations as well.

Results. See Table 6 for transcribed results from the one-on-one observations, by participant.

Participant one could not use the Firefox browser. The Browser needed a plug-in. In the Internet Explorer browser, the “spacebar” message kept appearing. The participant did not have any problem locating and hearing the audio. She noticed that Guanabenz was misspelled on the Participants Guide. She thought the system would be a useful tool.

Participant two clicked the video first. On the second attempt, she clicked the audio link. This participant also used Internet Explorer and received the “spacebar” message. After figuring out the system, the participant did not have any problems locating and hearing the audio.

Participant three used the Firefox browser. It appeared the participant did not read the instructions. She tried to locate the drug using the Illustrated Guide. She became confused when the scrollbar would not work. The observer clicked the ePharm link. The participant clicked the audio link as well. She noticed that Guanabenz was misspelled on the Participants Guide. After figuring out the system, the participant did not have any problems locating and hearing the audio.

All the participants strongly agreed that the system would support efforts to learn to correctly pronounce the names of drugs, the system was easy to use, and they would recommend the system to other College of Medicine students.

Assessment of Results and Changes: It was recommended that the plug-in be installed on the testing laptop for future users. The correct spelling of the word Guanabenz should be changed on the Participants Guide. Also, a solution was needed to fix and eliminate the “spacebar” message that appeared.

Phase 3 Results: Learner usability testing using small group trials

Context. Small group trial evaluations were used to identify the strengths and weaknesses, other missing parts or improvement areas in the system, following the eLearning expert reviews and one-on-one trials.

Phase 3 testing took place in various locations: on the campus of St. Jude Children’s Research Hospital, in the Library at UTHSC, and in the University of Memphis library. All testing occurred on April 11, 2008. A Macintosh computer with Firefox was used in one case, with Windows and Internet Explorer used in the others. In one case, unexplained technical difficulties caused the computer to shut down whenever the audio link was activated. This situation (with the fifth and final subject) appeared to be influenced by the connectivity in the testing location, although no complete explanation was ever determined. Except for the fifth test, each test took between two to six minutes long.

Results. See Table 7 for transcribed results from the one-on-one observations, by participant.

Four out of five participants strongly agreed that the system was easy to use. Three out of five participants strongly agreed that they would recommend the system to others. Participant one was neutral. Two agreed the system would support efforts to learn drug names while two others strongly agreed.

Participant five had trouble with the computer and did not get to hear the drugs being pronounced. She did not answer the three questions. However, she did feel the system was a good idea.



Assessment of Results and Changes: It is recommended that a Portable Document Format (PDF) link be included so that users can print out the instruction pertaining to navigating through the ePharmacology system. This was also suggested by the SME.

Table 6: Summary of one-on-one observation results

One-on-one observation results	S1	S2	S3
Date	4/9/2008	4/10/2008	4/10/2008
Browser	Firefox; IE	IE	Firefox
Platform	Windows	Windows	Windows
Context	St. Jude, using observer's laptop	U of M using wireless connection	Not reported
TIMES			
Keys in web address	2:00 p Firefox; 2:03 p IE	2:00	2:11:05
Website fully loads	2:03:15	2:00:15	2:11:15
Reads instructions	2:04	2:00:30	2:12
Specified category located	2:04:40	2:01	2:12:15
Audio 1 played	2:05	2:01	2:15
Audio 2 played	2:05:15	2:02	2:16
Audio 3 played	2:05:45	2:02:15	2:17
Audio 4 played	2:06:15	2:02:30	2:18
Audio 5 played	2:06:45	2:02:45	2:18
Audio quality	Good	Good	Good
Number of times played each drug name	2	1	2
Remarks	<ul style="list-style-type: none"> • Thinks this should be a good tool since it is difficult to learn how to pronounce drug names. Couldn't do the test on Firefox; needed a plug-in. • Easily found the next drug; message appears asking to press "spacebar" or "enter" to activate and use. • No problem finding other drug; same message appears when audio link is pressed. • Noticed that Guanabenz was spelled incorrectly (on testing form); message appears 	<ul style="list-style-type: none"> • Clicks on video first. Then locates audio. Spacebar message appears. Participant has to clear message every time. • Only played audio once. • The spacebar message prevents a smooth transition. 	<ul style="list-style-type: none"> • Tried to locate drug using the Illustrated Guide; did not choose the correct drug from list; kept clicking audio and not getting feedback as a result. Had trouble getting scrollbar to work. Had to start over. • Transitioned from one drug to another with any problems. • Noticed drug 3 spelled wrong on participant's guide.



Table 7: Summary of small group observation results

Small group observation results	SG1 (Medical student)	SG2 RN, St. Jude	SG3 RN, St. Jude	SG4 RN, St. Jude	SG5 RN, St. Jude
Date	4/11/2008	4/11/2008	4/11/2008	4/11/2008	4/11/2008
Browser	Firefox	IE	IE	IE	IE; Firefox
Platform	Macintosh	Windows	Windows	Windows	Windows
Context	UTHSC lab	Not reported	Not reported	Not reported	St. Jude computer*
TIMES					
Keys in web address	12:02	12:10	4:10	4:24	4:30
Website fully loads	12:02	12:10	4:10:50	4:24	4:30:15
Reads instructions	12:03	12:11	4:11	No	4:32
Specified category located		12:11:15	4:11	4:25	4:32
Audio 1 played	12:03	12:12	4:13	4:25	5:00
Audio 2 played	12:04	12:12	4:14	4:26	5:01
Audio 3 played	12:04	12:13	4:14	4:26	5:01:15
Audio 4 played	12:04	12:14	4:15	4:27	5:01:30
Audio 5 played	12:04	12:14	4:16	4:27	5:01:45
Audio quality	Good	Good	Good	Good	Did not play
Number of times played each drug name	2	2	2	1	0
	SG1 (Medical student)	SG2 RN, St. Jude	SG3 RN, St. Jude	SG4 RN, St. Jude	
Remarks	Note: This was the first year medical student. <ul style="list-style-type: none"> Participant hesitated before playing audio; kept reading message that appears in video area (download additional plugin) Transitioning from one drug to another was smooth Transition was smooth Forgot to play audio 3 twice; transition was smooth Transition was fine 	Clicks video. Then asks if video not available. Observer response “No it’s not available.” Realizes is looking for audio and clicks the audio. States that system is needed because it is so hard to pronounce drug names.	<ul style="list-style-type: none"> Clicks video; asks about video not loaded. Observer states that focus is on audio. Read instructions. Participant had no problem. The transition was fine. It took a “minute” for the last drug to load. 	<ul style="list-style-type: none"> Clicks video first. Then audio; each once. Did not read instructions; rushed through Transition was fine. 	

* Subject 5: Tried to click drugs on guide. Computer shuts down when she clicked the video could not play audio files. Had to start over. Clicked video again and computer shut off. Tried to click audio, but no sound. Had to use a laptop computer to get an Internet connection on the laptop. Just located all the drugs; couldn’t hear audio due to computer shutting off. Used IE on desktop, but wouldn’t connect to Internet. States that system seems like a good idea. Read all instructions.

Phase 2 and 3 survey results

As already presented in the one-on-one and small group evaluation discussion, and seen in Figure 4, survey results from the observation subjects were quite positive.



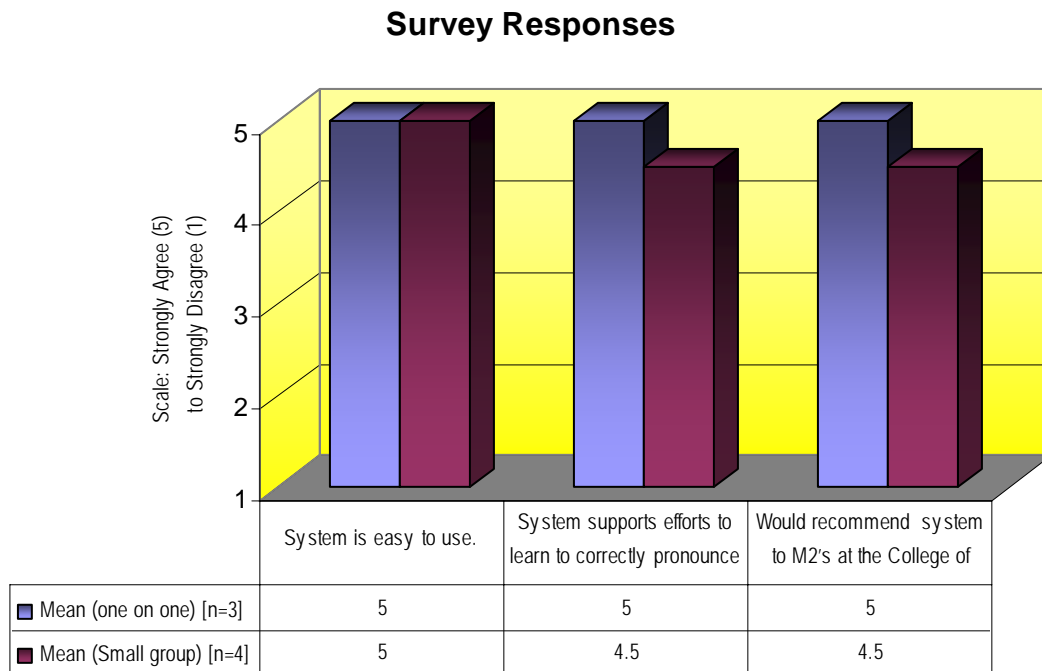


Figure 4: One-on-one and small group survey responses

Recommendations/Conclusions

Valuable information was gained from the eLearning expert reviews and the one-on-one and small group evaluations. Changes that were deemed necessary were made to the product, as summarized in Table 8.

Table 8: Summary of formative evaluation issue resolutions

Issue	Resolution
<i>eLearning expert review</i>	
1. Attempts to play audio on non-autonomic categories failed	<ul style="list-style-type: none"> Removed all but Autonomic category from remaining tests, as only Autonomic was part of original scope.
2. Usability of the instructions	<ul style="list-style-type: none"> Streamlined language using bullet points; add a downloadable copy of the Illustrated Guide, with link placed on the guide page.
3. Video download time	<ul style="list-style-type: none"> No change made to video download time, as video placeholder simply reserves space for future additions.
4. Prose required tweaking	<ul style="list-style-type: none"> Prose edited for succinctness.
5. Outdated font and table presentation of database table	<ul style="list-style-type: none"> Changed font to sans serif; modified table with alternating color rows and white borders.
6. Bottom of screen requires delimiter	<ul style="list-style-type: none"> Added colored band with copyright as footer to delimit end of page.



Issue	Resolution
7. Left frame size too wide.	<ul style="list-style-type: none"> Adjusted left frame by (a) changing category style to smaller heading size (H4), (b) adding a bottom border color to aid visual tracking to right side of frame, and (c) making the frame border movable so user could control frame width.
8. Appearance of Quicktime symbol	<ul style="list-style-type: none"> No change was made as this was considered an acceptable situation.
<i>One-on-one Trials</i>	
9. Some users mistook the Illustrated Guide for the actual live web page	<ul style="list-style-type: none"> Added at the top of the Guide page (a) a prominent link to the ePharm page and (b) a link to download a new pdf version of the guide. Also placed the link to the ePharm page on the home page.
10. Missing plug-in on observer's test machine	<ul style="list-style-type: none"> The plug-in was installed before the next observation. To the downloadable guide, added a notation about checking for plug-ins.
11. Press spacebar message appears on IE browsers, interrupting the flow of the page.	<ul style="list-style-type: none"> The design team determined to continue to monitor the occurrence of the "spacebar" message to determine whether it persisted. If so, code would need to be researched to suppress this message. During research into a solution for this Windows problem, Microsoft pushed out an automatic update that appeared to have corrected this issue. No further action was considered necessary.
12. User error in double-clicking the audio start button.	<ul style="list-style-type: none"> Appears to be a browser-specific and plug-in issue. Made no modification, anticipating users who double-clicked would realize that a single click would suffice. The issue of whether to single or double-click is a recurring issue with Windows applications, and users generally recognize that if one does not work, the other will.
13. Drug name misspelled on observation guide.	<ul style="list-style-type: none"> Unfortunate typo, but did not impact product's effectiveness. No action taken.
<i>Small group trials</i>	
14. Tried to click drugs on guide.	<ul style="list-style-type: none"> This issue was noted in the one-on-one trials. The corrective plan of action was implemented following the small group trials.
15. Computer shut down when one subject clicked the video.	<ul style="list-style-type: none"> This issue could not be replicated and thus a resolution was not found. It may have been an anomaly peculiar to the workstation or the Internet connection or the firewall.

Three global questions informed the formative evaluation process: system performance, usability, and utility. The following discussion presents findings for each of these questions, summarized across three phases of the formative evaluation. In addition, recommendations for future consideration are presented.

System Performance

Through the evaluation, it was concluded that the system did operate as designed:

- The initial screen did appear in the browser window (Firefox, Internet Explorer and Safari were used).
- The links from one page to another were functional
- Drug categories and drug names loaded from the backend database to the front end interface.
- The system permitted the user to select any drug within the specified category.
- The system legibly presented drug information, including applicable brand names and phonetic pronunciation guide for the generic name about the selected drug.
- The system operated without error



Two additional questions regarding system operation which were posed in the original evaluation plan were no longer applicable once the product reached testing phase. (i.e., Did the system support user selection of a specified drug category? When a user selected a specified category, did the system present the list of drugs that belonged to that category?) The original plan was to let the user select a category from a list, see the list of drugs belonging to that category, and then select a drug to see its information. This feature was abandoned as unnecessarily complex, requiring unnecessary keystrokes from the user as well as additional programming at the technical side. The process was simplified by presenting a scrolling list of drugs grouped by category, from which the user needed only make a single selection. (This design change also negated the need for an evaluation question in the next section.)

System Usability

The next series of questions for the evaluation focused on usability. These findings were also very positive.

- The system did provide users with an onscreen method to play audio pronunciation of a specified drug.
- The audio files did play on the user's system (when they selected a drug from the appropriate category).
- The system was successful in permitting the user to play a given audio file repeatedly.
- The audio was audible to the user.
- The interface was intuitive enough for users to navigate without needing outside assistance.
- The system did permit users to select a different drug from the same category without having to restart the system.
- All subjects in the one-on-one and small group trials strongly agreed that the system was easy to use.

A user "error" which occurred was an attempt to "play" audio from the Illustrated Guide page instead of going to the ePharm page. As discussed earlier, a link to "Begin using ePharm" was added prominently on the home page as well as on the guide page (above the screen shot). Additionally, a download link for the guide was added, for off-line reference if needed. The design team discussed repositioning the ePharm page as the first page on the website. Since the system was intuitive to use, and not all users appeared to read the instructions, this seemed to be a viable option. However, this change was not made, since the team believed there were sufficient cues in the system for users to realize on their own which page had the active content.

Further recommendations

Consider adding code to check for presence of plug-in and an advisory to user if it is missing.

If users continue to try to "play" audio from the Illustrated Guide, consider reorienting the four web pages, with the ePharm page placed as the first page the users encounter.

There was also some confusion about how to use the system, specifically with regard to selecting drugs that did not have audio files associated with them. This issue arose from including drugs that were outside the scope of the project. Once the owners of the product fully populate the database with audio links, this will not be a problem. Until that time, however, the problem may continue.

Further recommendation:

If this confusion resurfaces, one solution might be to present only those drugs for which audio is available. This can be done by modifying an existing query to add another condition to display an abbreviated version of the database. The other solution would be for the course director to review this fact with the class while conducting an orientation to the product.



System Utility

The final question of interest in the evaluation was the extent to which the users believed the system would support their efforts to learn to pronounce the names of drugs correctly. Participants in the one-on-one trials unanimously agreed this was the case. Small group participants also strongly agreed, although two (the single medical student and one of the St. Jude nurses) were not as strong as the others in their agreement. The medical student was also equivocal about recommending the system to other medical students at the College of Medicine.



► Appendix A

eLearning Expert Review Instruments, with transcribed results

Product: ePharm

Heuristic usability evaluation

Instructions: Please specify your test conditions: (If you test the product with more than one platform or browser, and your responses differ accordingly, please use the space provided for each dimension to indicate which conditions are relevant to your responses.)

SECTION 1

Platform and OS version

Windows, version: _____ Subject 1

Macintosh, version: _____ Subject 2 (10.5)

Browser

Firefox, version: _____ Subject 1, version 2.0.0.13
Subject 2: versions 2 and 3beta

Internet Explorer, version: _____ Subject 2: Safari 3.1

Other: (specify, with version) _____

Test date: Subject 1: 4/3/8
Subject 2: 4/4/8

Duration of test: Subject 1: not specified
Subject 2: 1 hour

SECTION 2: 5 Dimensions

Instructions: For each of the following FIVE dimensions, please indicate your agreement using the scale provided. Then, add any comments relevant to the overall dimension, including specific details that will help us better identify areas we need to address. THANK YOU for your time!

1. Dimension: User control and interaction	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The system provides users with appropriate feedback		S2		S1	
Feedback is provided within a reasonable period of time				S1	S2
The system gives the user control over the ability to exit from the system at any time				S1	S2: I just close the browser, right?
The system incorporates shortcuts that can cut down user navigation time		S2: there are no shortcuts, but none are needed. It's just one click.		S1	
<i>Comments on user control and interaction:</i>					
S1: Video took a bit too long to download and begin playing.					
S2:					
<ul style="list-style-type: none"> • Tried firefox 2, firefox 3 beta, and safari, all on Mac OS X 10.5. • In all 3 browsers the audio files (audio player) did not appear, and the phonetic pronunciation guide did not appear. I also saw no video connected with any of the drug choices I made, and I checked about 30. 					
Browser: _____			Platform: _____		



2. Dimension: verbal and visual quality	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The material is presented in real-world language				S1; S2	
Specialized knowledge of technology and databases is NOT required in order to use this system.				S1; S2	
The system is consistent in its use of language				S1; S2	
Visual elements in the system are internally consistent			S1	S2	
Visual elements are aesthetically pleasing			S1; S2 not bad, just fine		
Dialog covers the essentials.				S1	S2
The system does NOT present irrelevant information.				S1	S2
<i>Comments on verbal and visual quality:</i>					
S1:					
<ul style="list-style-type: none"> • The database generated information (under the middle two tabs) looks 1997-ish. I suggest sans-serif fonts and a “cleaner, more modern looking” table/cells. • Consider a footer, band of color, or something to signify the bottom of the window. I always feel like I have to do some scrolling (and I don’t) on the 2 database pages. • The size of the left frame of the ePharm page should be reduced and the headings better formatted. This frame is creating lots of empty space and putting too much distance between the list and the database generated information (table). • Overall, from a graphic design standpoint I think this looks like something to be submitted as a (really good) school project rather than something to be presented to a client. However, I think the edits are quick and easy. 					
S2: Some of the prose may need some tweaking. It’s clear though.					
Browser: <input type="text"/>		Platform: <input type="text"/>			

3. Dimension: Errors	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Error messages are easily understood by ordinary users.					
Users are able to recover from operator errors.					
<i>Comments on errors:</i> NOTE: when errors are encountered, please document where they occur and, if possible, what actions led to the error.					
S1: Not applicable					
S2:					
<ul style="list-style-type: none"> • Didn’t see any error messages, unless you count a quicktime symbol instead of an audio player. • Not much chance for operator error. Just click on the drug. 					
Browser: <input type="text"/>		Platform: <input type="text"/>			



4. Dimension: Instructions and help	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Instructions are visible.				S1	S2
Instructions are readily available.				S1	S2
Help is provided when needed.				S1; S2	
When provided, help is concise and to the point.			S2: NA	S1	
Space devoted to help is proportionate to the rest of the screen content.			S2: NA	S1	
<i>Comments on Instructions and help:</i> S2: NA = not applicable There's not really a help system in this site. Instead, there are instructions, and they are clear.					
Browser: <input type="text"/>		Platform: <input type="text"/>			

5. Dimension: Organization	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The structure is logical.				S1; S2	
The interface is intuitive				S1; S2	
<i>Comments on Organization:</i> S1: Based on my understanding, I think you have delivered what the client requested. S2: Just fine. No problems.					
Browser: <input type="text"/>		Platform: <input type="text"/>			

SECTION 3: Additional Issues

Instructions: Using the space provided, please document each additional issue you identify in the product. Briefly describe the issue, specify where you encountered it in the system, and then use the two scales to rate its (a) severity and (b) extensiveness. If needed, add more rows to the table.

Issue		(a) Severity			(b) Extent		
Description	Location	3 (Critical)	2 (Non-critical but attention recommended)	1 (Fix if time permits)	3 (Occurs in 3 or more places)	2 (Occurs twice)	1 (Occurs only once)
S2: No additional issues, but the ones I mentioned are very important.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Additional comments:

S1 returned the response form with the following message in e-mail:

My feedback is attached. I think it would be a good idea to get 1-2 non-tech-types to also provide feedback. As far as the feedback goes, I very well may be an outlier with my data related to the graphic design, but I figured you'd want me to be honest. Overall, very, very good!!!

S2 returned the response form with the following coming in the e-mail:

Here's my experience. Couldn't view pronunciations or video unfortunately. Call me if you like. The project manager spoke with S2 by phone within twelve hours. The reviewer had NOT linked to the Autonomic drugs, which were the only drugs for which there were pronunciations, video, or phonetic spellings.



► Appendix B

One-on-one and small-group evaluation testing

Preparation logistics

- Send the following thank you/confirmation email to participants, confirming time and place. If we are provided with email addresses of the participants, we will send the email. Otherwise, we will have to rely on the class officers and/or Dr. Brescia to communicate directly with them.

Dear M2 student:

Thank you for agreeing to help us evaluate the College of Medicine's new ePharmacology system. We designed this web-based product to give you easy access to a support system you can use to practice the pronunciation of the generic names of the drugs you study in your Pharmacology course.

The evaluation will take about 15 minutes of your time, and will take place in the _____ (computer lab in room xxxx at UTHSC).

For the evaluation, we will give you a short list of tasks to perform using the new system. You'll use an Internet-connected computer and a web browser during the evaluation. One of the designers will be observing you and taking notes about how well the system works for you.

If you have questions during the evaluation, feel free to ask the observer. However, our main purpose is to find out how well the system can be operated without outside assistance. We are not in any way evaluating you! Our purpose is to have the intended audience give the system a test drive so we can find out where we might need to make improvements.

(Sign the email and be sure they have your email address, in case they need to contact you).

- Materials needed by evaluator:
 - Watch with sweep second hand (or stop watch)
 - copy of observer's testing script
 - copy of participant's guide
 - copy of observer's notes log
- Site preparation (in the lab ahead of time)
 - Contact the lab monitor to be sure access will be available and that computers have audio capability.
 - Conduct an audio check of the system to make sure audio is available, not muted, and volume is turned up.
 - Note the operating system/platforms available
 - Start the internet browser
 - Note the browser name/version.
 - If both Mac and Windows computers are available for testing, alternate between the two.



- At completion of each test:
 - Collect the user's instruction sheet when he has finished (remember to get him to answer the question at the bottom of the page).

Observer's Testing Script

Script	Observer notations/actions
Please open the Internet browser on the computer.	Record Start time, record platform and browser (see Observer Notes Form)
I'm going to give you the website address for the ePharmacology system and a list of five of the autonomic drugs you'll be studying in Pharmacology class.	Hand out the Participant's Guide
As you can see, the website address you need is _____	Point out the web address on the Guide
What we want you to do is go to the web address, take your time to read the instructions, and then proceed to locate each of the drugs (from the autonomic category) on the list.	Point out the list of drug names on the Guide
Once you find the drug, <ul style="list-style-type: none"> • check it off your list, • play its audio pronunciation two times • and check the pronunciation off the list. 	Point out the check off location on the Guide. Add "Feel free to play the audio more than twice if you feel the need to do so."
After you've found all five drugs and played their audio, please answer the three questions at the bottom of your guide.	Point out the 3 survey questions at the bottom of the Guide.
I'll be happy to answer any questions you might have.	
Please begin	Use the Observer's Notes Log form to make notations about the test. In addition to recording the times when the events occur, use the comments area to record questions asked, answers given, and your perceptions of <ol style="list-style-type: none"> 1. Apparent ease in finding/recognizing/using the audio button (hesitations, scrolling actions, mouse clicks, other overt actions indicating ease) 2. Clarity of audio playback 3. Ease of transition to next item in the test (next drug): hesitations in figuring out how to select a different drug; navigation techniques used.



Participants' Guide

Formative Evaluation for the ePharm system

Today's Date: _____

Website Address: _____

(Log-in instructions: *if applicable*)

Here is a list of 5 generic drugs in the “**Autonomic**” category of the ePharm system.

Please proceed through the list one drug at a time.

When you have located the drug in the system:

1. Check the name off from the list
2. Play the audio pronunciation twice

Then proceed to the next drug in the list.

Autonomic drug name	Check when located	Check when played audio file
• Dobutamine	<input type="checkbox"/>	<input type="checkbox"/>
• Selegiline	<input type="checkbox"/>	<input type="checkbox"/>
• Guanabenz	<input type="checkbox"/>	<input type="checkbox"/>
• Ipratropium	<input type="checkbox"/>	<input type="checkbox"/>
• Mecamylamine	<input type="checkbox"/>	<input type="checkbox"/>

Please rate your response to each of the following statements using the provided scale:	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I think this system will support my efforts to learn to correctly pronounce the names of drugs.					
This system is easy to use.					
I would recommend this system to other M2's at the College of Medicine.					

(optional) My email address is: _____



Observer's Notes Log

Date:	
Observation type	<input type="checkbox"/> One-on-One
	<input type="checkbox"/> Small Group

Platform used (check one): Windows Macintosh

Observer Name:			
Subject #	001	002	003

Subject #	1	2	3	4	5
------------------	---	---	---	---	---

Browser (check one): IE Firefox Safari Other. **Version:** ____

Event	Time		Comments. (Also document questions asked and answers given)
Keys in web address			
Web site fully loads			
Reads instructions			
Specified category located			
DRUG 1 located			
Audio	Played	# times	Audio quality?
Transitions			
DRUG 2 located			
Audio	Played	# times	Audio quality?
Transitions			
DRUG 3 located			
Audio	Played	# times	Audio quality?
Transitions			
DRUG 4 located			
Audio	Played	# times	Audio quality?
Transitions			
DRUG 5 located			
Audio	Played	# times	Audio quality?



► Technical Appendix

Styles2.css (Stylesheet for htm pages)

```
/* ----- "generic" styles */

body {
    margin: 0;
    padding: 0;
    background: #FFE;
    color: #333;
    font: small "Lucida Grande", Arial, sans-serif;
    margin-bottom: 0px;
}

a {
    text-decoration: none;
}

a img {
    border: 0;
}

p {
    margin: 0 0 1em;
}

/* ----- masthead styles */

#masthead {
    margin-bottom: 0.5em; padding-top: 1px;
    background: #003300;
}

#masthead p {
    margin: 0.25em 0 0 0;
    padding: 0 0.25em 0.25em 0.25em;
    border-bottom: 5px #FF9900 double;

    font-family: Garamond, "Times New Roman", serif;
    font-weight: bold;
    font-size: 36pt;
    font-stretch:extra-expanded;

    text-align: left;
    color: #FFE;
}

#masthead p.img {
    border-right: 1em;
```



Styles2.css (Stylesheet for htm pages)

```
}

#navlinks {
    margin: 0; padding: 0.5em 3em;
    background: #396D39; color: #FFFFFF;
}

#navlinks li {
    display: inline;
    margin-right: 0.5em; padding-right: 0.75em;
    border-right: 1px solid #FC840A;
    font-weight: bold;
}

#navlinks li.last {
    border-right: 0;
}

#navlinks a {
    color: #98BC1D;
}

#navlinks a:hover {
    color: #FF9900;
}

/* ----- main column styles */

#content {
    float: left;
    padding: 0 20em 1em 3em;
}

#content h1 {
    margin: 0 33% 1.25em -2em; padding: 0.5em 2em;
    background: #F90; color: #124411;
    font-size: 1.5em;
}

#content h1 b {
    color: #D4EC84;
}

#content h2 {
    margin: 0.5em 0; padding-bottom: 0.25em;
    background: #FFE; color: #F90;
    border-bottom: 1px solid #B0D742;
    font-size: 1.5em;
}

#content img.illus {
    float: left;
```



Styles2.css (Stylesheet for htm pages)

```
margin: 1em 1em 1em 0;
}

/* ----- sidebar styles */

#sidebar {
    float: left;
    width: 17em;
    margin: 0 0 4em -18em;
}

/*-----#sidebar div h3 {
    background: #F90
}*/

#sidebar div {
    background: #D4EC84; color: #124411;
    padding: 0 1em 1em;
}

#sidebar div h3 {
    font-size: 1.25em;
    margin: 0 -0.8em; padding: 0.4em 0.8em;
    text-transform: lowercase;
    background: #F90
}

#tip-of-the-day h4 {
    margin: 0 0 0.5em; padding: 0.5em 0;
    border-bottom: 1px solid #FFF;
    font-weight: normal;
}

#future-feature p:first-line {
    font-style: italic;
}

/*----- footer styles */

#footer {
    clear: both;
    padding: 0.5em 3em;
    background: #D4EC84;
}

#footer p {
    margin: 0;
    font-size: smaller;
}

/* ----- epharm styles */
```



Styles2.css (Stylesheet for htm pages)

```
#epharm {
    width: 100%;
    height: 100%;
}

#druglist a {
    text-decoration: underline
}
#druglist ul {
    list-style-type: none;
}

#druglist li {
    text-decoration: none;
    padding: 0px;
}

#druglist h4 {
    margin: 0.5em 0.25em 0;
    padding-bottom: 0em;
    border-bottom: 1px solid #b0d742;
    font-size: 1.25em;
}

#drugtable h4 {
    margin: 0.5em 0.25em 0;
    padding-bottom: 0em;
    font-size: 1.25em;
}

#drugtable {
    margin: 0 1.5em;
}
```



Php Scripts for data connections on ePharm page

E_pharm_content_1.php (left frame in frameset)

```
<?php require_once('Connections/epharm.php'); ?>
<?php
if (!function_exists("GetSQLValueString")) {
function GetSQLValueString($theValue, $theType, $theDefinedValue = "",
$theNotDefinedValue = "")
{
    $theValue = get_magic_quotes_gpc() ? stripslashes($theValue) : $theValue;

    $theValue = function_exists("mysql_real_escape_string") ?
mysql_real_escape_string($theValue) : mysql_escape_string($theValue);

    switch ($theType) {
        case "text":
            $theValue = ($theValue != "") ? "'" . $theValue . "'" : "NULL";
            break;
        case "long":
        case "int":
            $theValue = ($theValue != "") ? intval($theValue) : "NULL";
            break;
        case "double":
            $theValue = ($theValue != "") ? "'" . doubleval($theValue) . "'" :
"NULL";
            break;
        case "date":
            $theValue = ($theValue != "") ? "'" . $theValue . "'" : "NULL";
            break;
        case "defined":
            $theValue = ($theValue != "") ? $theDefinedValue : $theNotDefinedValue;
            break;
    }
    return $theValue;
}

mysql_select_db($database_epharm, $epharm);
$query_masterlcategories = "SELECT * FROM categories ORDER BY Category";
$masterlcategories = mysql_query($query_masterlcategories, $epharm) or
die(mysql_error());
$row_masterlcategories = mysql_fetch_assoc($masterlcategories);
$totalRows_masterlcategories = mysql_num_rows($masterlcategories);

mysql_select_db($database_epharm, $epharm);
$query_detail2drugnames = "SELECT * FROM drugnames WHERE CatID='123456789'
ORDER BY DrugName";
$detail2drugnames = mysql_query($query_detail2drugnames, $epharm) or
die(mysql_error());
$row_detail2drugnames = mysql_fetch_assoc($detail2drugnames);
$totalRows_detail2drugnames = mysql_num_rows($detail2drugnames);
?><!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
```



E_pharm_content_b.php (right frame displayed before drug selection)

```
<?php require_once('Connections/epharm.php'); ?><?php
if (!function_exists("GetSQLValueString")) {
function GetSQLValueString($theValue, $theType, $theDefinedValue = "",
$theNotDefinedValue = "")
{
    $theValue = get_magic_quotes_gpc() ? stripslashes($theValue) : $theValue;

    $theValue = function_exists("mysql_real_escape_string") ?
mysql_real_escape_string($theValue) : mysql_escape_string($theValue);

    switch ($theType) {
        case "text":
            $theValue = ($theValue != "") ? "'" . $theValue . "'" : "NULL";
            break;
        case "long":
        case "int":
            $theValue = ($theValue != "") ? intval($theValue) : "NULL";
            break;
        case "double":
            $theValue = ($theValue != "") ? "'" . doubleval($theValue) . "'" :
"NULL";
            break;
        case "date":
            $theValue = ($theValue != "") ? "'" . $theValue . "'" : "NULL";
            break;
        case "defined":
            $theValue = ($theValue != "") ? $theDefinedValue : $theNotDefinedValue;
            break;
    }
    return $theValue;
}
}

$colname_DetailRS1 = "-1";
if (isset($_GET['recordID'])) {
    $colname_DetailRS1 = $_GET['recordID'];
}
mysql_select_db($database_epharm, $epharm);
$query_DetailRS1 = sprintf("SELECT * FROM drugnames WHERE DrugID = %s ORDER
BY DrugName", GetSQLValueString($colname_DetailRS1, "text"));
$DetailRS1 = mysql_query($query_DetailRS1, $epharm) or die(mysql_error());
$row_DetailRS1 = mysql_fetch_assoc($DetailRS1);
$totalRows_DetailRS1 = mysql_num_rows($DetailRS1);
?><!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<title>Untitled Document</title>
<link href="styles/_styles2.css" rel="stylesheet" type="text/css" />
<style type="text/css">
```



E_pharm_content_b.php (right frame displayed before drug selection)

```
<!--
.style1 {
    color: #E1E1E1;
    font-size: 1px;
}
-->
</style>
</head>

<body>
<div id="drugtable">
<table width="600" border="1" align="left" cellpadding="1" cellspacing="0"
bordercolor="#ffffff">
    <tr>
        <td colspan="4" valign="middle" bgcolor="#FF9900"><h4>Drug
Information</h4></td>
    </tr>
    <tr valign="middle">
        <td width="99"><strong>Drug Name</strong></td>
        <td width="166"><div align="center">&nbsp;</div></td>
        <td width="166"><div align="center">&nbsp;</div></td>
        <td width="166" align="center"><div align="center">&nbsp;</div>

        </div></td>
    </tr>
    <tr valign="middle" bgcolor="#E1E1E1">
        <td><strong>Category</strong></td>
        <td colspan="3">&nbsp;</td>
    </tr>
    <tr valign="middle">
        <td><strong>Area</strong></td>
        <td colspan="3">&nbsp;</td>
    </tr>
    <tr valign="middle">
        <td><strong>Sub-Area</strong></td>
        <td colspan="3">&nbsp;</td>
    </tr>
    <tr valign="middle" bgcolor="#E1E1E1">
        <td rowspan="2" valign="middle" bgcolor="#E1E1E1"><strong>Brand
Name(s)</strong></td>
        <td valign="middle" bgcolor="#E1E1E1"><div
align="center">&nbsp;</div></td>
        <td valign="middle" bgcolor="#E1E1E1"><div
align="center">&nbsp;</div></td>
        <td align="center" valign="middle" bgcolor="#E1E1E1"><div
align="center">&nbsp;</div></td>
    </tr>
    <tr valign="middle">
        <td valign="middle" bgcolor="#E1E1E1"><div
align="center">&nbsp;</div></td>
        <td valign="middle" bgcolor="#E1E1E1"><div align="center"></div></td>
        <td align="center" valign="middle" bgcolor="#E1E1E1"><div
```



E_pharm_content_r.php (right frame in frameset)

```
$theValue = ($theValue != "") ? $theDefinedValue : $theNotDefinedValue;
break;
}
return $theValue;
}
}

$colname_DetailRS1 = "-1";
if (isset($_GET['recordID'])) {
    $colname_DetailRS1 = $_GET['recordID'];
}
mysql_select_db($database_epharm, $epharm);
$query_DetailRS1 = sprintf("SELECT * FROM drugnames WHERE DrugID = %s ORDER
BY DrugName", GetSQLValueString($colname_DetailRS1, "text"));
$DetailRS1 = mysql_query($query_DetailRS1, $epharm) or die(mysql_error());
$row_DetailRS1 = mysql_fetch_assoc($DetailRS1);
$totalRows_DetailRS1 = mysql_num_rows($DetailRS1);
?><!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<title>Untitled Document</title>
<link href="styles/_styles2.css" rel="stylesheet" type="text/css" />
<style type="text/css">
<!--
.style3 {
    font-size: 1px;
    color: #E1E1E1;
}
-->
</style>
</head>

<body>
<div id="drugtable">
<table style="border: solid 1px #ffffff" border="1" align="left"
cellspacing="1" cellpadding="0" width="600" bordercolor="#ffffff">
<tr>
<td colspan="4" valign="middle" bgcolor="#FF9900"><h4>Drug
Information</h4></td>
</tr>
<tr valign="middle">
<td width="99"><strong>Drug Name</strong></td>
<td width="166"><div align="center">&nbsp;<?php echo
$row_DetailRS1['DrugName']; ?></div></td>
<td width="166"><div align="center">&nbsp;<?php echo
$row_DetailRS1['Pronunciation']; ?></div></td>
<td width="166" align="center"><div align="center">&nbsp;<?php
<embed height="25" src="<?php echo $row_DetailRS1['audiolocation']; ?>"
volume="75" loop="False" controls="console" autostart="False" width="128">
</embed>
</td>
</tr>
</table>
</div>
</body>
</html>
```



E_pharm_content_r.php (right frame in frameset)

```
</div></td>
</tr>
<tr valign="middle" bgcolor="#E1E1E1">
  <td><strong>Category</strong></td>
  <td colspan="3"><?php echo $row_DetailRS1['CatName']; ?> &nbsp;</td>
</tr>
<tr valign="middle">
  <td><strong>Area</strong></td>
  <td colspan="3"><?php echo $row_DetailRS1['Area']; ?>&nbsp;</td>
</tr>
<tr valign="middle">
  <td><strong>Sub-Area</strong></td>
  <td colspan="3"><?php echo $row_DetailRS1['SubArea']; ?>&nbsp;</td>
</tr>
<tr valign="middle" bgcolor="#E1E1E1">
  <td rowspan="2" valign="middle" bgcolor="#E1E1E1"><strong>Brand
Name(s)</strong></td>
  <td valign="middle" bgcolor="#E1E1E1"><div align="center"><?php echo
$row_DetailRS1['BrandName1']; ?>&nbsp;</div></td>
  <td valign="middle" bgcolor="#E1E1E1"><div align="center"><?php echo
$row_DetailRS1['BrandName2']; ?>&nbsp;</div></td>
  <td align="center" valign="middle" bgcolor="#E1E1E1"><div
align="center"><?php echo $row_DetailRS1['BrandName3']; ?>&nbsp;</div></td>
</tr>
<tr valign="middle">
  <td valign="middle" bgcolor="#E1E1E1"><div align="center"><?php echo
$row_DetailRS1['BrandName4']; ?>&nbsp;</div></td>
  <td valign="middle" bgcolor="#E1E1E1"><div align="center"></div></td>
  <td align="center" valign="middle" bgcolor="#E1E1E1"><div
align="center"></div></td>
</tr>
<tr valign="middle">
  <td><strong>Video</strong></td>
  <td colspan="3" valign="top"><div align="center">
    <embed height="130" src="<?php echo $row_DetailRS1['videolocation'];
?>" volume="75" loop="False" controls="console" autostart="False"
width="125">
    &nbsp;</embed>
  </div></td>
</tr>
<tr valign="middle">
  <td height="2px" colspan="4" bgcolor="#E1E1E1"><span
class="style3">blank</span></td>
</tr>
</table>

</div>
</body>
</html><?php
mysql_free_result($DetailRS1);
?>
```

