

Sociology Learning Environment Assessment Plan

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ISLT 9455: Formative and Summative Evaluation

Executive Summary

The following document describes a proposed methodology for evaluating a learning intervention intended for implementation in an introductory sociology course at a large, mid-western University. The proposed evaluation includes a formative component to assess the design of the intervention prior to its implementation as well as a summative component to assess the effectiveness of the intervention once it has been deployed.

In the formative evaluation, we propose to conduct a usability study of the learning environment to expose any design weaknesses that might interfere with student learning. The usability study will consist of expert reviews of the learning environment and participant studies including user observations and interviews. This data will be analyzed with the intent to recommend improvements to the existing design of the environment.

For the summative evaluation, we will compare student pretest and post-test scores to assess learning outcomes. We will also survey the students and interview their instructor to evaluate the effectiveness of the implementation from both the teaching and learning perspectives. We will use the resulting data to identify the strengths of the learning intervention as well as to recommend potential enhancements to the unit content, the design of the learning environment, and the implementation strategy.

We estimate that it will take eight months to complete both components of the evaluation at an approximate cost of \$3,000. The evaluation team includes five graduate students, one external usability and design expert, and the instructor of the introductory sociology course. Any design changes required based on the results of the formative assessment prior to implementation of the intervention are not included in the budget provided in this proposal.

Introduction

This document contains a plan for evaluating a web-based learning environment designed to support a face-to-face introductory sociology course. The learning environment was built to encourage students to apply concepts and theories covered in lectures and textbook readings to real-world situations so that they will understand the relevance of sociology in their daily lives. The client has requested an evaluation of the environment design to ensure that it will support these goals.

This plan has been created by evaluation team members Said Al Ghenaimi, Holly Henry, Yanyan Huang, Ngoc Vo, and Jeff Young. The evaluation plan is divided into several sections. The **Background** section describes the learning activity being evaluated. The **Purposes** and **Audiences** sections discuss why the evaluation is being conducted as well as the stakeholders who have an interest in this evaluation and its results. Which decisions should be influenced by the results of this evaluation, both positive and negative, can be found in the **Decisions** section. Under the **Questions** section, the reader may find not only the questions being addressed by this evaluation but also by which methods the data were collected. Further information about the evaluation's designs and procedures can be located in the **Methods** section. To identify those individuals involved in the evaluation process, refer to the **Sample** section. The **Instrumentation** section describes the data collection tools which were used while examples of the actual instrumentation tools can be located in the **Appendices**. The report will conclude with information about **Limitations, Logistics, Timeline, and Budget**.

Background

An online learning environment has been developed for an introductory sociology course for undergraduate students. According to the instructor of the course, the target learners are most

frequently freshmen with little to no prior experience in the field. While students may range in age, most are traditional college age (18-22). Most of the students will not be sociology majors; rather, they will take the course as a general requirement for other majors. Of those that are sociology majors, few will actually pursue graduate education in the field and become practicing sociologists.

Though the course primarily takes place in a traditional face-to-face classroom environment, the online component has been designed to help students apply sociological theories and concepts in everyday life situations. The application consists of three case-based problem solving scenarios in which students are required to choose between various candidates and justify their decisions using sociological reasoning for their warrants. In other words, students are expected to think like sociologists in solving problems presented in the cases.

In the first learning scenario, students role-play a landlord and decide between two candidates for an apartment. The second scenario has the students playing the role of a company CEO who must choose which of three individuals to hire for an open position, taking into account the qualifications of the candidates and the opinions of a group of vice presidents. For the final scenario, the Sociology students assume the role of a college admissions officer and choose which of three fictional candidates should be awarded admission into the school.

In order to solve the problem in each case, the learners should spend time and effort reading the details of the case, analyzing the data from a sociological perspective, and providing appropriate solutions to the problem. Thus, they must make a decision to support one of the possible candidates and to support their position with evidence.

The learning environment is primarily designed to present cases as problem-solving activities using cognitive flexibility hypertext (Spiro, Feltovich, Jacobson, & Coulson, 1992).

The purpose of cognitive flexibility hypertext is to encourage students to understand that the problems presented are ill-structured and complex with many often contradictory perspectives that must be addressed in order to propose valid solutions. Cognitive flexibility hypertext necessitates the use of non-linear navigation through the case data because a linear path through the material would artificially suggest that the problem presented is simple with a "right answer" solution. However, non-linear navigation makes the navigation task itself more complex for the environment's users. A key question to be addressed in formative evaluation is how to present the navigation in such a way as to support the desired application of cognitive flexibility theory while not interfering with the user's ability to find all of the relevant material for each case.

Another navigation requirement that must be addressed in the evaluation of the design is that students are permitted to refer back to cases that they have previously completed while working on later ones, but the instructor does not want them to refer to later cases when working on earlier ones. In other words, users should be able to navigate to cases 1 and 2 from case 3, but should not be able to navigate to cases 2 and 3 when they are working on case 1.

Purpose

This evaluation will contain both formative and summative components. The formative evaluation investigates The usability of the e-learning environment will be the focus of the formative evaluation and effectiveness of the implemented environment in terms of how well it meets its learning objectives and its integration in the classroom will be the focus of the summative evaluation. The specific purpose for the formative evaluation is to collect usability information regarding navigation, consistency, aesthetics, efficiency, and documentation. Collected data will be analyzed in terms of how well the design supports student learning.

The specific purposes for summative evaluation are to identify students' achievement of learning objectives through the online application and to identify appropriate employment of the application in terms of implementation time, duration, and methods.

Audiences

For the formative evaluation of the learning environment, the audience is interested in usability. This audience includes Dr. Brent, the current instructor for the learning environment, and the development team for the learning environment.

For summative evaluation of the implementation of the learning environment, audiences are interested in the assessment of the application's effectiveness, discussion of its implementation, and student reflection. Primary audiences include Dr. Brent and other MU Instructors of Sociology who are interested in using the online learning environment. Secondary audiences for the summative evaluation may include the larger communities of instructors of sociology and researchers in Educational Technology.

Decisions

Findings from the evaluation can be influential on decision-making for the implementation of the e-learning products. The formative evaluation will be used to determine the readiness of the e-application for classroom implementation. On the other hand, the summative evaluation will determine whether or not the implementation of the application effectively promotes student learning of sociological theories and concepts related to structural inequality. Therefore, the following decisions will be anticipated:

1. Usability related issues of the interface will be considered during the application of online learning (formative).
2. Online application will be used to foster learning of sociology theory (formative).

3. The case studies will be modified to ensure the delivery of the intended knowledge (summative).
4. Instructional strategies will be modified to ensure the achievement of the desired learning objectives (summative).

Questions

1. The following questions will be asked during the formative evaluation:
 - 1.1 Are the case studies written clearly with adequate details to support the activity?
 - 1.2 Does the font size and style allow for good readability?
 - 1.3 Does the font color and style provide sufficient contrast with the background?
 - 1.4 Is the information presentation logical?
 - 1.5 Do all the links work and is navigation intuitive?
 - 1.6 Is the language and vocabulary appropriate for novice learners in Sociology?
 - 1.7 Is the reading level appropriate for the target audience?
 - 1.8 Is the layout of the page logical and visually appealing?
 - 1.9 What are the learning objectives and how are they measured?
2. The following questions will be asked during the summative evaluation:
 - 2.1 How well do learners achieve the desired learning outcomes?
 - 2.2 How well do students understand the case studies and how to apply sociological theories to solving the problems presented therein?
 - 2.3 How can the learning environment be improved to better support the learning objectives?

- 2.4 How can the related assignments be improved to better support the learning objectives?
- 2.5 How can the information delivery method be improved to better support the learning objectives?

Methods

Based on the purpose and evaluation questions previously discussed, as well as budget and timelines, we propose a multiple methods evaluation design for this project. Our planned data collection and analysis are described below in separate sections for the formative and summative components of the evaluation.

Formative Evaluation

In the formative evaluation, we will triangulate user observation with semi-structured user interviews to describe the usability aspects of the learning environment and discover areas for improvement. In order to ensure that we have at least two data sources for each question and that we are evaluating the design against the instructor's needs as well as the needs of his students, we will also conduct an interview with the instructor as part of the formative evaluation. The following matrix illustrates which of these sources will be used to answer the formative assessment questions:

Formative Assessment Questions	User Observation	User Interview	Instructor Interview
1.1 - Are the case studies written clearly with adequate details to support the activity?	X	X	X
1.2 - Does the font size and style allow for good readability?		X	X
1.3 - Does the font color and style provide sufficient contrast with the background?		X	X

1.4 - Is the information presentation logical?	X	X	X
1.5 - Do all the links work and is navigation intuitive?	X	X	
1.6 - Is the language and vocabulary appropriate for novice learners in Sociology?		X	X
1.7 - Is the reading level appropriate for the target audience?		X	X
1.8 - Is the layout of the page logical and visually appealing?	X	X	X
1.9 - What are the learning objectives and how are they measured?	X		X

We will utilize a deductive or top-down approach to code the interviews and observations. The coding scheme will be derived from the formative assessment questions. Themes in the various coding categories will be summarized, and patterns both within and across the coding categories will be analyzed.

Instruments

Expert Review Protocol (Appendix A). Three graduate students will conduct an expert review of the sociology case study website using Nielsen's Heuristic Checklist (1994). Each expert will use the ten principles of Nielsen's Heuristic Checklist to review the website individually. Then the three experts will collaborate to share their findings. Finally a report will be generated that includes rating of each element, strengths and weakness and recommendation to improve the website.

Usability Protocol (Appendix B). Our usability protocol is an adaptation of a form currently being used by the IElab (2009b). This instrument provides instructions to participants about the study and the four specific tasks they will complete. The usability protocol also identifies for facilitators the purpose for each activity and the behavior to be observed. The protocol concludes with three exit interview questions for facilitators to ask participants.

Summative Evaluation

For the summative evaluation, we will be gathering quantitative data on student performance using a pre-test / post-test strategy. To describe the impact of this method of instruction on learning outcomes, we will gather qualitative data through the use of semi-structured interviews with students and the instructor regarding their experiences with the learning environment. The following matrix illustrates which of these sources will be used to answer the summative assessment questions:

Summative Assessment Questions	Pre/Post Tests	Learner Questionnaire	Instructor Interview
2.1 - How well do learners achieve the desired learning outcomes?	X		X
2.2 - How well do students understand the case studies and how to apply	X		X

sociological theories to solving the problems presented therein?			
2.3 - How can the learning environment be improved to better support the learning objectives?		X	X
2.4 - How can the related assignments be improved to better support the learning objectives?		X	X
2.5 - How can the information delivery method be improved to better support the learning objectives?		X	X

We will use descriptive statistics to assess any improvement from pretest to post-test scores. We will further analyze the quantitative data for any relationships between improvement and answers to Likert scale questions on the learner questionnaire.

We will utilize a deductive or top-down approach to code both the instructor interview and the open-ended questions from the learner questionnaire. The coding scheme will be derived based upon the questions. Themes in the various coding categories will be summarized, and patterns both within and across the coding categories will be analyzed.

Instrumentation

Pre-test and Post-test. Pretest and post-test instruments will each take the form of a short reading passage comprised of an argumentative essay about social inequality accompanied by 15 multiple choice questions that ask students to identify sociological content and strengths and weaknesses of the argument contained in the presented essay. The pre-test instrument will be administered after the course chapter on social inequality but prior to the opening of the assignments involving the case study website. The post-test instrument will be administered one week after the due date for the third case study assignment.

Student Survey (Appendix C). The Student Survey includes four questions in which the users will rate how their learning experience was affected by using the sociology case study website. A fifth, open-ended question will allow the users to make suggestions as to how the assignments could be improved.

Instructor Interview. The Instructor Interview instrument will include space to indicate the date of the interview, the name of the interviewee, and the name of the interviewer. It will also outline the following questions for the interview to discuss with the interviewee:

1. What are your instructional strategies to employ the sociology case study website?
2. Does the case study website satisfy your instructional strategies? Why or why not?
3. How can the learning environment be improved to better support the learning objectives?
4. Do you have any difficulty in using the case study website?

5. What changes would you suggest to the case study website to better support your interaction with it?

Limitations

While the methodology as described above is designed to evaluate the learning intervention as thoroughly as possible within time, resource, and budget constraints, it is not without limitations. While the findings of these evaluations may be informative for others considering similar learning interventions or teaching similar material, the results should not be generalized beyond the current implementation.

The quantitative instruments used in these evaluations have not been tested for statistical reliability and validity. While inter-rater reliability procedures will be incorporated in the qualitative analysis of the user observation and interview data, the evaluation questions guiding that analysis are based upon an existing design. Consequently, the results are intended to inform current design decisions and should not be considered to determine optimum design for introductory sociology courses in general.

The summative evaluation of learning outcomes will not include comparison to other interventions nor to a control group. Since the summative evaluation will be based upon a single-semester implementation, the results may not be typical of student performance in future semesters.

Logistics

At the beginning of the project, the entire team will be responsible for meeting with the client, preparing instruments, and team discussion. Said and Ngoc will be facilitate the formative evaluation with responsibilities including preparing and analyzing data; conducting the Expert Review; recruiting, observing, and interviewing usability study participants; and reporting and

delivering the formative evaluation results. Holly, Yanyan and Jeff will facilitate the summative evaluation with responsibilities including preparing and analyzing data; meeting with the instructor to determine testing schedule; conducting the pretest and post-test; surveying students; interviewing the instructor; and reporting and delivering the summative evaluation results.

Timeline

Formative Evaluation Timeline

1. July 2009 – meet with client
2. August 2009 – prepare instruments, recruit study participants
3. September 2009 – expert review, conduct usability study
4. October 2009 – analyze formative evaluation data
5. November 2009 – report and deliver formative evaluation results

Summative Evaluation Timeline

1. August 2009 – schedule pretest and post-test
2. September 2009 – conduct pretest
3. December 2009 – conduct post-test, deliver student survey
4. January 2010 – analyze summative evaluation data
5. February 2010 - report and deliver summative evaluation results

Budget

Task	Personnel	Estimated Hours	Estimated Cost
Prepare instruments	Graduate students	20	\$240
	Expert	5	\$250
Recruit participants	Graduate students	5	\$60
Expert review	Expert	10	\$500
User participation	Graduate students	10	\$120
Pretest/ post-test	Graduate students	10	\$120
Instructor interview	Graduate students	2	\$24
Analyze data	Graduate students	40	\$480
	Expert	10	\$500
Prepare reports	Graduate students	10	\$120
	Expert	4	\$200
Deliver reports	Graduate students	2	\$24
	Expert	1	\$50
Participant incentives	n/a	n/a	\$100
Usability lab usage	n/a	n/a	\$100
Office expenses	n/a	n/a	\$50
<i>(Graduate students - \$12 per hour/ Expert - \$50 per hour)</i>			
Total			\$2938

References

- Information Experience Laboratory. (2009a). Participation Consent Form: University of Missouri School of Information Science & Learning Technology.
- Information Experience Laboratory. (2009b). Usability Protocol: University of Missouri School of Information Science & Learning Technology.
- Nielsen, J. (1994). Ten Usability Heuristics. Retrieved April 9, 2009, from http://www.useit.com/papers/heuristic/heuristic_list.html
- Spiro, R. J., Feltovich, P. J., Jacobson, M. J., & Coulson, R. L. (1992). Cognitive Flexibility, Constructivism, and Hypertext: Random Access Instruction for Advanced Knowledge Acquisition in Ill-Structured Domains. In D. H. Jonassen & T. M. Duffy (Eds.), *Constructivism and the technology of instruction : a conversation* (pp. 121-128). Hillsdale, N.J.: Lawrence Erlbaum Associates Publishers.

APPENDIX A: Expert Review Protocol

Checklist	Scale: (5) Excellent (4) Very Good (3) Good (2) Acceptable (1) Minimal (0) Unacceptable	Comments
<p>1. Visibility of system status</p> <p>The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.</p>		
<p>2. Match between system and the real world</p> <p>The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.</p>		
<p>3. User control and freedom</p> <p>Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.</p>		
<p>4. Consistency and standards</p> <p>Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.</p>		
<p>5. Error prevention</p> <p>Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.</p>		
<p>6. Recognition rather than recall</p> <p>Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.</p>		
<p>7. Flexibility and efficiency of use</p> <p>Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.</p>		

<p>8. Aesthetic and minimalist design</p> <p>Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.</p>		
<p>9. Help users recognize, diagnose, and recover from errors</p> <p>Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.</p>		
<p>10. Help and documentation</p> <p>Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.</p>		

Adapted from Nielsen, J. (1994). Ten Usability Heuristics.

APPENDIX B: Usability Protocol

Adapted from (Information Experience Laboratory, 2009b)

We are a team of five graduate students at the university of Missouri-Columbia. As a part of our course, Formative & Summative evaluation, we are evaluating an online learning environment for Dr. Brent's Sociology class. We would like to thank you for agreeing to participate in this study.

You may quit this session anytime you wish. Before we begin, I will briefly go over what a usability session consists of, what will be expected of you, and what our goals are in conducting this study.

It is important to understand that we are looking for feedback in order to improve the design of this website. We are not testing you. If you find errors or if you have any difficulties with the application, it is very likely that other people visiting the site will also experience those same difficulties. We will use this information to better understand how to improve the Sociology case study website.

During the Session:

You will be asked to perform a series of tasks using the Sociology case study website and at the same time you will be asked to “think aloud” i.e. you will talk about what you are doing, thinking, looking for, clicking on, etc. The tasks are structured to determine if the most important information and features of the site are easy to locate and use. We ask that you try to accomplish the tasks without assistance, as if you were at home trying to find the information on your own. This gives us a better idea of the things that work well or the difficulties people experience. At any time during the session, if you feel you need additional assistance beyond what is available on the Sociology case study website, you may ask the facilitator for clarifications.

Tasks:

Questions		For facilitator	
1.	Where can you find the requirements for each assignment?	Test purpose: assignment requirement	Observe - Task completion: yes/no - Duration: - User confusion:

2.	You would like to save the answer to the sociology problem. How do you do that?	Test purpose: how to save work	Observe - Task completion: yes/no - Duration: User confusion:
3.	You are typing answer to sociology problem 2 and you would like to refer back to the case study materials for confirmation of some information. How can you do that?	Test purpose: how to access case study materials when you are typing the answer	Observe - Task completion: yes/no - Duration: User confusion:
4.	You would like to submit the answer to the 1st sociology problem. How do you do that?	Test purpose: how to submit assignment	Observe - Task completion: yes/no - Duration: User confusion:

Exit Interview Questions

1. Which task was the most difficult to complete?
2. Is the information presented in the case studies consistent to the course material?
3. If you have to change the case studies, which part will you suggest to change?

APPENDIX C: Sociology Argumentation Project Survey

Please rate your experience of using the sociology case study website for the argumentation assignments in this course:

1. These assignments helped me to improve my understanding of inequality and social stratification compared to the textbook/lecture alone:	A. Strongly agree B. Agree C. Neither agree nor disagree D. Disagree E. Strongly disagree
2. These assignments helped me to improve my understanding of Social Conflict theory and Social Interaction theory compared to the textbook/lecture alone:	A. Strongly agree B. Agree C. Neither agree nor disagree D. Disagree E. Strongly disagree
3. These assignments helped me to improve my ability to write an argumentative essay:	A. Strongly agree B. Agree C. Neither agree nor disagree D. Disagree E. Strongly disagree
4. These assignments were more interesting to me than the other assignments in this course:	A. Strongly agree B. Agree C. Neither agree nor disagree D. Disagree E. Strongly disagree

5. I could have learned these topics better if the following changes were made to these assignments (open ended essay):

APPENDIX D: Participation Consent Form

Adapted from (Information Experience Laboratory, 2009a)

The purpose of this usability study is to evaluate the design of the sociology case study website. We are interested in understanding how people can accomplish common tasks and easily find information using the online sociology system. The session will not "test" you or your ability; rather the session will test the online environment to provide information on areas that might be improved. Please be advised that there are no risks associated with participation in this session.

During this session, you will be asked to complete some tasks using the sociology case study website and at the same time you will be asked to think aloud. As you complete the tasks, members of the Information Experience Laboratory will observe and take notes. In addition, the session will be captured on video for future review. The session will last no longer than an hour.

If for any reason you are uncomfortable during the session and do not want to complete a task, you may say so and we will move on to the next task. In addition, if you do not want to continue, you may end the session and leave at any time.

Approximately 5 undergraduate students who are enrolled in Dr. Brent's Sociology class will be the participants of our study. The results from all sessions will be included in a usability report to be presented to the sociology case study website development team. Your name and identity will not be included in the report.

If you wish to speak with someone about your participation in this study, or if you feel you were not treated as described above, please contact Dr. Julie Caplow, 303 Townsend Hall, (573)884-1706.

I, _____, have read and fully understand the extent of the study and any risks involved. All of my questions, if any, have been answered to my satisfaction. My signature below acknowledges my understanding of the information provided in this form and indicates my willingness to participate in this user testing session. I have been given a blank copy of this consent form for my records.

Signature: _____

Date: _____