School of Education Indiana University Bloomington

Fall 2008

EDUC-R690: Application of Research Methods to IST Issues

Credits: 3
Class hours: Thursday, 1:00 - 3:45 p.m. in ED 2275
Instructor: Ted Frick
Office and phone number: ED 2218, (812) 856-8460

Table of Contents

- Goal and Objectives
- Overview of Course
- About Plagiarism: Do not do it!
- Evaluation and Grading
- Readings

Goal and Objectives

The goal of R690 is:

> **To help you learn disciplined inquiry in Instructional Systems Technology through first-hand experience -- i.e., by by doing representative research tasks and critquing research done by others.**

Objectives

1. Conduct interviews for needs assessment (qualitative method).
2. Do content analyses (qualitative method).
3. Conduct usability evaluations (qualitative and quantitative methods, problem diagnoses).
4. Write report describing needs assessment, results, usability evaluation, results, and recommendations (for client and instructor).
5. Analyze existing survey data with SPSS (quantitative methods, tool skills).
6. Critique research reports done by others.

We will only have time to do an introduction or overview of most of these tasks in this class. But you will get your hands on data, do data analysis by hand and with computers, and even collect some data yourself. Similarly, you will critique research articles in the IST field, but this will be at an introductory level.

You will take inquiry courses where you can study and apply these techniques in greater depth; you will likely have opportunities in working with faculty mentors in R695 seminars to use some of these techniques and tools skills and to refine them; and of course you will do research yourself culminating in a dissertation study at the end of your Ph.D. program in which you will very likely use one or more of the above techniques.

Overview of the Course

1. **Do a needs assessment of stakeholders for the the client, the IST Department.** This will

involve collection and analysis of mostly qualitative data from several sources in order to find out what tasks the stakeholders need to do on the IST Website.

1.1. *Interviews of IST residential and distance students, faculty and staff.* Once we have a set of interview questions (which we will develop together in class), **each R690 student will conduct three interviews** and write up results of **each** interview (this a deliverable for R690). R690 students will work in pairs; each one does each interview with his or her partner as an observer. Both must listen and write down what the interviewee says.

1.2. *Collect FAQs from information gatekeepers*. What are the 10 most frequently asked questions: how often; who asks, when asked, how asked; and what is the answer to each FAQ.

1.3. *Do content analysis of results from 1.1-1.2.* This will be a class activity led by the instructor. Results of this content analysis will be recorded and shared with the clients.

2. **Do usability tests of the current Website.**

2.1. Use content analysis results from 1.3. to identify tasks for the usability tests. R690 students are paired. Each pair conducts two usability tests and writes them up (this a deliverable).

2.2. Do a content analysis to identify usability problems with the current Website. This will be a class activity.

None of the inquiry tasks above will require human subjects approval by the IRB, since these are class activities for learning purposes, and the results will not be published. This is not research resulting in generalizable knowledge or results to be disseminated, according to the definition of research in the IRB requirements.

The basic goals here are for students to practice interviewing skills, practice doing content analysis for synthesis, practice doing a usability test, and doing yet another content analysis in the problem identification. These are largely qualitative methods, but applied to an IST kind of issue -- i.e., how to improve some kind of technology product.

3. **Write report for client**.

This report will describe the study conducted above, which includes:

A. Procedures for conducting the interviews and interview questions for the needs assessment, results of needs assessment, and content analysis of results (Team A).

B. Tasks and procedures for usability evaluation; results of usability evaluation; and recommended changes in the IST Website based on the results (Team B).

The writing of this report will need to be done by dividing tasks and coordinating among the R690 students. Team A will write the needs assessment section, and Team B will write the usability evaluation section. Each member of the team will be graded according to the quality of the overall team report, and according to independent peer evaluations of each team member's contributions.

4. **Analyze existing data.**

The next project for R690 will involve analysis of survey data. Students will be analyzing some existing survey data (already collected in a previous study -- with data on 460 subjects, which is sanitized), in order for students to get practice in doing basic descriptive statistics and their interpretation.

Each student will be given a set of analysis tasks as a deliverable. Each student will work with a unique subset of 60 cases to be done via SPSS and is expected to interpret the results in an **individual** written report. The analysis tasks will include use of the appropriate *descriptive* statistic and interpretation. Several relationships between variables will be described using the appropriate measure of association (e.g., Pearson Product Moment correlation, chi square, Spearman's rho). In addition, you will do a

pattern analysis for combinations of 3 or more classifications.

5. **Choose an existing research study in an area of interest in IST, present a summary of the research to the class, and lead a discussion that critiques the study.**

The presentation and discussion during an R690 class meeting will last approximately 45 minutes. The presentation should be done in Powerpoint, and include:

5.1. A summary of the purpose of the study, how or why it is relevant to IST, research questions addressed, methods used, and results or conclusions of the study by its author(s).

5.2. Identify major strengths and weaknesses of the research study according to criteria discussed in class, as well as in Fraenkel and Wallen (2006) for the type of research that is attempted.

6. **Write a formal critique of that research study, using APA style.**

The critique should include a:

6.1. Description of the purpose of the study, how or why it is relevant to IST, research questions addressed, methods used, and results or conclusions of the study by its author(s).

6.2. Description of each criterion used and justification of it according to philosophic principles and/or accepted values held by research methodologists regarding the respective research method(s) used in the study being evaluated.

6.3. Application of each criterion to the study being evaluated and description of how the criterion was or was not met.

About Plagiarism: Do not do it!

Originality of Work: all work you submit for R690 must be largely your own. Plagiarism will not be tolerated. If you plagiarize the work of others, you will receive a failing grade for R690 and be reported to the IST chairperson for disciplinary review. **If you do use the work of others, it must be a minor portion of what you submit and the original creator must be fully credited and such credits must be clearly visible to the user.**

Evaluation and Grading

Deliverable	Due Date	Max. Points	Points
1. Conduct interviews and report results for needs assessment.	Sept. 17	15	
2. Conduct usability tests and report results.	Oct. 1	15	
3. Write report on needs assessment and usability evaluation and submit to instructor for submission to client.	Oct. 8	15	
4. Analyze survey data and write brief report with tables and interpretations of results.	Oct. 29	15	
5. Present summary of research study to class and lead discussion of its critique.	As assigned during Nov./Dec.	15	
6. Write paper using APA style that critiques a research study in our field that includes description of study, criteria used, justification of criteria, application of criteria and conclusions of evaluation.	Dec. 12	25	
Total		100	

Grading Scale

- A+ = 100
- A = 95 - 99
- A- = 90 - 94
- B+ = 85 - 89
- B = 80 - 84
- B- = 75 - 79
- C+ = 70 - 74
- C = 65 - 69
- C- = 60 - 64
- etc.

Readings

Fraenkel, J., & Wallen, N. (2006). *How to Design and Evaluate Research in Education* with PowerWeb (6th ed.) New York: McGraw-Hill. (required -- just order it online for yourself, e.g., at Amazon.com)

Steiner, E. (1988). *Methodology of Theory Building*. Sydney: Educology Research Associates. (available online for R690 students).

Additional readings are listed in the R690 schedule and resources (IU network ID and password required for the latter).

R690 Syllabus | Schedule | Resources | Google Group

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Tentative Schedule of Activities

Week	Date	Activities and Assignments
1	Sept. 4	**Note: Many readings that are linked to below require your IU network ID and password for access.** Preparation for class: • Read: Epistemology of Educology: A Framework for Knowledge Claims about Education In class: • Course overview. • Introduce yourselves and learning goals for this class. • 45-minute research project (in class, illustrates different kinds of knowledge created by research) • Debrief on educology After class: • Take the online quiz, Understanding Plagiarism at Indiana University (takes about 10 minutes). If needed, do the online tutorial and take the test. • Do the Protection of Human Subjects in Non-Biomedical Research tutorial • Take the Protection of Human Subjects in Research certification test (send results to instructor).
2	Sept. 11	Preparation for class: • Read Interviews. • Read Observation and Interviewing. • Read Practical Web Development, Chapter 1, The Big Picture. • Read Practical Web Development, Chapter 3, Analyze Your Needs and Those of Your Users. In class: • Plan interview questions for target audiences • Plan interview questions for getting FAQs • Interview teams assigned • Interviewees assigned to teams • Schedule interviews to be completed before next class and written up • Practice interview skills: simulation After class:

		• Create interview forms in Word and post to Oncourse (will be assigned to someone in class)
3 and 4	Sept. 18 Sept. 25	**Preparation for class:** • Each team of two conducts THREE interviews (at least once as the interviewer, and at least once as the observer). You will inteview members of the target audience. • Each team member takes notes during the interview, using a form we develop in class in Word. • Combine notes and write up the responses that the interviewees make to each question in separate Word documents (use the forms we have created, and fill them in after each question). • You must post your interview documents by Wed. Sept. 17 at midnight, so everyone can read everybody else's interview results before class on Wed. • Print interview results for your own interviews and bring to class. • Read Content Analysis. • Read Uncovering Usability Needs Before You Design. **In class:** • Bring scissors and scotch tape. Instructor will provide 3x5 cards. • Bring hardcopy of your interview. Set the margins in Word to 4 inches apart before you print it, so that you can cut out each user response and tape it to a 3x5 card as needed during class. • Conduct content analysis of interview results, using the documents posted in Oncourse. • Determine which needs appear to be greater than others. • Prepare a summary document that outlines findings.
5	Oct. 2	**Preparation for class:** • Read The Problem of Unusable Products and Systems. • Read Usability testing on 10 cents a day. • Read Practical Web Development, Chapter 5, Test the Paper Prototype, pp. 1-15 . • Read Practical Web Development, Chapter 7, Test the Computer Prototype, pp. 1-10 . **In class:** • Watch video of usability test. • Plan authentic tasks for usability test based on needs assessment and content analysis done previously. • Plan for selecting authentic subjects and conditions for usability testing. • Plan the usability tests. • Create usability testing teams. • Practice doing a usability test on a computer with the tasks. **After class:** • Create usability test observation form for everyone to use • Create usability test script for everyone to use • Create 6 sets of task cards for everyone to use
6	Oct. 9	**Preparation for class:** • Select your subjects and conduct your usability tests, recording on the observation form. • Write up usability results and post in Oncourse (in other words, type your hand-written

9		observations into the Word form so they are legible).

observations into the Word form so they are legible).
- You must post your usability results documents by Wed. Oct. 1, at midnight, so everyone can read everybody else's interview results before class on Wed.
- Read Building a Large, Successful Website Efficiently through Inquiry-based Design and Content Management Tools, pp. 20-26.
- Read Practical Web Development, Chapter 5, Analyze the Results (pp. 15-21).
- Read User-Centered Design and Usability Testing of a Website: An Illustratative Case Study.

In class:

- Bring hardcopy of your usability results document.
- Do content analysis of tasks, observations, and problems users had with the design of the SoE Website.
- Create list of problems with the design.
- Prioritze problems in terms of severity.
- Create table of results for the client.
- Debrief on the usability testing process and its role in design and development.

7	Oct. 16	Preparation for class:

Preparation for class:

- Read Statistical Techniques for Analyzing Quantitative Data.
- Read Fraenkel & Wallen (2006): Chapter 17, Survey Research, pp. 396-425.
- Read the Study Information Sheet for the TALQ study
- Take the Survey (complete all items to familiarize yourself with the questionnaire -- evaluate a course you took recently)
- Read the report: Improving Course Evaluations to Improve Instruction and Complex Learning in Higher Education

In class:

- Presentation by Rajat Chadha
- Introduction to SPSS
- Conduct descriptive statistical analyses with SPSS and TALQ data

8	Oct. 23	Preparation for class:

Preparation for class:

- Get your data set from your Oncourse dropbox (from TALQ study)
- Read Fraenkel & Wallen (2006): Chapter 10, Descriptive Statistics, pp. 187-218.
- Practice descriptive analyses as we did in last class.
- If you want a student license for SPSS 14 on your own PC or Mac, you can purchase it at the Stat/Math Center. Otherwise, you can use SPSS in the Student Technology Clusters (e.g., Wright Education 2011, 2015, 2025).
- In SPSS 14, you can learn about basic statistics and how to use SPSS. In the menu bar at the top, click on '**Help** > **Tutorial**'.

In class:

- Continue descriptive analysis, including measures of association with SPSS.
- Create scales from sets of items.
- Demonstrate reliability of scales.
- Get Mentor accounts from Oncourse dropbox
- Work on Project 3 assignment

9	Oct. 30	Preparation for class

		• Watch and listen to: Predicting Patterns in Education (50 min. movie of presentation) • Read: New Ways to Measure Systemic Change: Map & Analyze Patterns & Structures Across Time • Read: Analysis of Patterns in Time In class: • Do MAPSAT APT with temporal data • Do MAPSAT APC with structural data After class: **Choose a published empirical research study in an area of interest to you, scan it and convert to .pdf. Send this to Prof. Frick for review and approval for class critique.**
10	Nov. 6	No class. AECT Conference in Orlando, FL. **Choose a published empirical research study in an area of interest to you, scan it and convert to .pdf. Send this to Prof. Frick for review and approval for class critique.**
11	Nov. 13	Preparation for class: • Read: The Fixation of Belief. • Read: Types Knowledge Claims about Education and their Value. • Read: Collaborative learning and positive experiences: does letting students choose their own groups matter? (Laurie's study for critique) • Read: Critiques of Research (outline for your papers) In class: • Research critiques overview. • Present individual research critique: **Laurie Carmody**

12	Nov. 20	Preparation for class:
		
		• Read Creswell: A Framework for Design (of research) (2003)
		• Read Creswell: The Use of Theory (in research) (2003)
		• Read examples of critiques from past R690 students:
		    ○ Multimedia Learning in an Interactive Self-Explaining Environment: What Works in the Design of Agent-Based Microworlds?
		    ○ Instructional Technology and School Reform Models
		• Read Fraenkel & Wallen: Part 1, Chapter 1; Part 2, Chapters 2, 6, 8, 9 and Part 5 Chapter 18 (start reading now and as needed for in-class critiques).
		• Read research articles for critiques:
		    ○ Influences of Individual and Situational Characteristics on Measures of Training Effectiveness. (Zihang's article)
		    ○ Web-Based Learning: How Task Scaffolding and Web Site Design Support Knowledge Acquisition. (Serdar's article)
		
		In class:
		
		• Present individual research critiques: **Zihang Shao and Serdar Abaci**

13	Nov. 27	No class -- Thanksgiving break

14	Dec. 4	Preparation for class:
		
		• Read examples of critiques from past R690 students:
		   ○ Human Performance Technology and Knowledge Management: A Case Study
		   ○ A Look at M-CDPS Systemic Reform
		• Read Fraenkel & Wallen: Part 2, Chapters 2, 6, 8, 9 and Part 5 Chapter 18 (continue).
		• Read:
		   ○ An Empirical Study into the Learning Transfer Process in Management Training (Seolim's article)
		   ○ Issues and Trends in Instructional Technology (Sinem's article)
		
		In class:
		
		• Present individual research critiques: Seolim Kwon and Sinem Karabacak

15	Dec. 11	Preparation for class:
		
		• Read: articles for research critique from fellow classmates
		   ○ Learning by Doing Versus Learning by Viewing (Da Bae's article)
		   ○ The Relationship between Adult Students' Instructional Technology Competency and Self-Directed Learning Ability in an Online Course (Yeol's article)
		
		In class:
		
		• Present individual research critiques: Da Bae Lee and Yeol Huh
		
		Assignment due:
		
		• Written critique due Friday, Dec. 12. Post in Oncourse

16	Dec. 12	Finals week: no final exam. Complete course evaluation online.

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Resources

Virtual Office

Acrobat Connect: Login as guest (but do the mini-movies first to initially setup your audio and webcam)

Readings for Projects 1 to 4

- Protection of Human Subjects in Non-Biomedical Research tutorial on the Web
- Interviews. Leedy & Ormrod (2005). *Practical research*.
- Observation and Interviewing. Fraenkel & Wallen (2006). *How to Design and Evaluate Research in Education* with PowerWeb (6th ed.)
- Practical Web Development. Boling & Frick (2002), book on the Web.
- Content Analysis. Fraenkel & Wallen (2006). *How to Design and Evaluate Research in Education* with PowerWeb (6th ed.)
- Uncovering Usability Needs Before You Design. Dumas & Redish (1999). *A Practical Guide to Usability Testing*
- The Problem of Unusable Products and System. Rubin (1994). *Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests*
- Usability testing on 10 cents a day. Krug (2005). *Don't Make Me Think: A Common Sense Approach to Web Usability (2nd Edition)*
- Building a Large, Successful Website Efficiently through Inquiry-based Design and Content Management Tools. Frick, Su, & An. (2005). *TechTrends*.
- User-Centered Design and Usability Testing of a Website: An Illustratative Case Study. Corry, Frick & Hanson (1997). *ETR&D*.
- Statistical Techniques for Analyzing Quantitative Data. Leedy & Ormrod (2005). *Practical research*.
- Fraenkel & Wallen (2006): Chapter 17, Survey Research, pp. 396-425.
- Study Information Sheet for the course evaluation research study
- Web Survey (complete all items to familiarize yourself with the questionnaire -- evaluate a course you took recently)
- Improving Course Evaluations to Improve Instruction and Complex Learning in Higher Education
- Fraenkel & Wallen (2006): Chapter 10, Descriptive Statistics, pp. 187-218

Readings Related to Research Critiques

These are mostly PDF format and require Acrobat Reader, except as noted as HTML

Syntactically Correct Nonsense: Looks Like Scholarly Writing but Is Pure Bunk

- Computer science paper generator from MIT: write a computer science conference proposal in minutes!
  - Do you believe this is true?
- Transgressing the Boundaries: Towards a Transformative Hermeneutics of Quantum Gravity: A parody written by Alan Sokal*

*Physicist Experiments With Cultural Studies: NOT bunk, but an explanation by Sokal of what he did in the parody above which got published as a serious research paper in a top scholarly journal in the humanities, *Social Text*.

Foundations

1. Creswell: A Framework for Design (of research) (2003)
2. Creswell: The Use of Theory (in research) (2003)
3. Salmon: Foundations of Scientific Inference (1967) (problem of induction and attempted solutions)
4. Charles Sanders Peirce: The Fixation of Belief (1877)
5. Elizabeth Steiner: Recognizing Theory (Chapter 1, 1988):
6. Types of Knowledge Claims about Education and their Value (Frick, 2008)

Nine types of knowledge created by research and their value

		Types of Knowledge Claims about Education		
		1. Indexical (unique, specific, none-other)	2. Practical (how-to-do, particular, replicable)	3. Theoretical (universal, abstract, generalizable)
Types of Research Questions According to Axiology	a. Non-axiological: What is or was *it*?	1a	2a	3a
	b. Instrumental: What is *it* good for?	1b	2b	3b
	c. Intrinsic: Is *it* worthwhile?	1c	2c	3c

See: Types of Knowledge Claims about Education and their value (pdf) (Frick, 2008)

Notes:

- The 'it' is what is represented. For indexical knowledge, the representation is a description or portrayal of a unique, situated state of affairs in education (the 'it'). Practical knowledge is a representation of means (the 'it') to achieve a particular end. The how-to that is represented can be repeated by other persons and situated in more than one unique context. The representation can be in words, recordings of demonstrations, diagrams, procedural steps to follow, etc. Theoretical knowledge is a representation of universals and their interrelations (the 'it')—i.e., not situated or bound by time or place. For example, the concepts of 'teacher' and 'student' are universals in educational theory.

- 1a is description of something unique--e.g., *the* Inquiry Learning Forum (a unique software product for teacher professional development); a description of professional development of teachers in Indiana in 2001 in use of computers in K-12 education, and their needs; history of Montessori.

- 1b is a description of what something unique is good for--e.g., a case study in improving *the* IU Bloomington Website; educating school leaders (in the U.S. in recent years); Human Performance Technology and Management: A Case Study: Massey, Montoya-Weiss & O'Driscoll (2005).

- 1c is a description of the worthwhileness of something unique--e.g., Bad policy and bad law (critique of NCLB from a legal perspective); Book review by Gall (2005) of Curriculum, Plans, and Processes in Instructional Design (by Seel & Dijkstra, 2004);

- 2a is descriptions how-to-do education. Can be words, pictures, demonstrations, etc.--e.g., a description of a specific educational method, program, or strategy such as Montessori Method (cf. Lillard, 2005);

- 2b is a description of how well an educational method or program is working--e.g., Milwaukee study comparing Montessori and public K-12 education in reading and math ((Lillard & Else-Quest, 2006); Head Start reduces crime and improves achievement;

- 2c is a description of the intrinsic worthwhileness of a method or program (intrinsic value)-- Montessori Method philosophy, ethics (AMS)

- 3a is sometimes called descriptive or explanatory theory, i.e., scientific theory about teaching and learning, e.g., Cognitive Load Theory (van Merriënboer), SIGGS and Educational Systems Theory,

- 3b is sometimes called prescriptive theory, design theory or instructional design theory (for creating instruction and learning environments) -- e.g., elaboration theory (Reigeluth), 4C/ID Model (van Merriënboer); First Principles of Instruction (Merrill); Task-Centered Instructional Strategy (Merrill); Ten Steps to Complex Learning (van Merriënboer); does collaborative learning work?; what is problem-based learning?

- 3c is often called philosophic theory -- e.g., Educology of the Free is about the values of rationality and freedom of thought; e.g., rationale for problem-based learning (note that claims about efficacy of PBL are type 3b claims, not 3c)

Three Kinds of Knowing

An excellent scholarly treatment of kinds of knowing is:

Self-Organizing Natural Intelligence: Issues of Knowing, Meaning, and Complexity

by Myrna Estep

Axiology: the study of value (in philosophy)

- Instrumental value: belief about what something is good *for* (row 2 in Table 1)

- Intrinsic value: belief about what is good *in itself* about something (row 3 in Table 1)

- Epistemic value: belief about what something is (i.e., true belief about it), not what it is good for, nor what is intrinsically worthwhile (row 1 in Table 1)

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