How to do Human-Centered Research (Case Study: CS Ed)

CMSC 33231 - Diana Franklin
Welcome / Introductions

Introduce yourself - name, major, level
What are you interested in learning wrt HCI / CS Ed
One interesting / unique fact about you
What is this course about?

The research process

CS Ed research as a case study / example for learning the process
What is the Research Process?

1. Choose your research topic
2. Narrow it down and find your niche
3. Identify a research problem
4. Develop clear research questions
5. Create a research design to answer them
6. Write your research proposal
What is the Research Process?
Choosing a Research Topic

Need to choose a relevant, reasonable topic you care about

How do you judge your own ideas?!?
Narrowing to Research Question(s)

Read papers...... Lots and lots of papers.

Theory - learn the foundations, what might be good ideas

Related work - learn where others have gotten - build, don’t replicate
Creating a Research Design

Methods:

- They need to answer the research question
- They need to be practical and reasonable to accomplish
Write a Proposal

Engage the reader - make them care
Make your case with theory, related work, and your idea
Present reasonable methods
Address any other requirements of the proposal call

Not just dry data - need to weave a story / narrative that makes them want to care!!!
Do the research

Collect data

Analyze data
Write up the results

Shares many similarities to proposal +

Visualize data

Explain data

Make conclusions based on data
What does this course do?

Culminating project is research proposal

Goal: activities (assignments and in-class activities) build the skills necessary to make it through to writing your own research proposal.

Your proposal will represent a deep-dive on a subject you may want to pursue in your future.

That text can be used towards a thesis, dissertation, or fellowship application.
Assignments

Read at least 3 papers / class period (every week)

  I assign early in course

  You choose later in course

Choose topic area

Create milestones for feedback

Write a research proposal (at end)
In-class Activities

I present some information from the Cambridge Handbook on CS Education.

In groups, you answer the following question:

What makes papers successful in ____________ (enter attribute here)?
Grading

25% Individual Assignments
   Reading papers
   Project Milestones
15% In-class participation
10% In-class deliverables (results of in-class activities)
50% final project (research proposal)
Three Levels of Educational Understanding

1. Not understanding how to design something that would work for you.

2. Being able to articulate the requirements for and carry out a design for something effective for someone like you. **Introspection**

3. Being able to articulate the requirements for and carry out a design for something effective for a wide variety of people. **Listening, Empathy**
Why is sharing important?

- You can learn from others’ learning experiences.
- Others can learn from your learning experiences.
- Designing only for yourself is useless.
- Learning about what didn’t work for others helps us design better.
What classroom environment do we want? (attributes of a positive environment)

Respectful
Attentive to what others are saying
Encouraging
Constructive Discussion (even in the face of disagreement)
Collaborative
Open to early-stage ideas
What classroom environment do we want?

Helpful words / actions
Listening
Acknowledging merits of comment before criticizing
Awareness of different fields

Unhelpful words / actions
Overly negative feedback
Not responding to comment - changing subject
What is required for a positive learning environment?

- The entire purpose of sharing is to learn from others not like you.
  - What is normal to you is not normal to others
  - Struggles, challenges are all a normal part of the learning process
- A safe space
  - Only positive responses to sharing
  - Only positive statements about others
- We must all respect, inside and outside the classroom, each other’s experiences
Our HCI Context: CS Education

Research Process applies to any human-centered field

We will study details of CS Education, which you can apply to other areas

  Most HCI involves learning of some sort, so not too far off

For your independent project, you may choose any aspect of human-centered computing

  If you choose non-CS Ed, you’ll need to meet with me to decide on appropriate venues from which to search for your papers.
Potential Topics

How do students learn / how should we teach / what are strategies / what are environments / what scaffolds should we provide:

- Novice college-level programmers
- CS college-level theory (algorithms, discrete math, automata)
- K-12
- CS ethics
Potential Topics

- Systemic / cross-cutting issues
  - Equity & Diversity
  - Pedagogical approaches
  - Tangible computing
  - Ethics
  - English Language Learners
  - Students with learning disabilities
Potential Topics

Teachers

- Building teacher community
- Running professional development activities
- Scaffolds for the classrooms
Other topics

Run by me before choosing
The Role of Theory: Maslow’s Hierarchy of Needs

Guides what you **design**

Trauma-informed curriculum

Guides how you **analyze** data

Collect info, calculate values based on Maslow’s categories

Guides how you **interpret** data

Explain results based on adhering to or not to hierarchy
Readings for Next Class

Using theory in CS education
https://dl.acm.org/doi/10.1145/3230977.3230992

Distributed constructionism theory paper - using theory to guide design
https://dl.acm.org/doi/10.5555/1161135.1161173

Using SOLO taxonomy to guide data analysis
https://dl.acm.org/doi/10.1145/3291279.3339405

I will set up gradescope, place links in there, and ask a few questions about each paper. That will be ready end of day. I will send email when it’s ready!