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, with an emphasis on disseminating results

CS Ed research as a case study / example for learning the process
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

Practicality - do you have a viable group of students on which to pilot / test?
Critiquing Research Studies

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.

3. Being able to articulate the requirements for and carry out a design for something effective for a wide variety of people.

*Introspection*  
*Listening, Empathy*
Creating a Research Design

Methods:

They need to answer the research question

They need to be practical and reasonable to accomplish
Do the research

Collect data

Analyze data
Write a paper

Engage the reader - make them care

Make your case with theory, related work, and your idea

Present reasonable methods

Visualize data

Explain data

Make conclusions based on data

Not just dry data - need to weave a story / narrative that makes them want to care!!!
33231 Approach

The Process of Research

- Identify the Research Problem
- Review the Literature
- Specify a Research Purpose
- Collect Data
- Analyze and Interpret Data
- Report and Evaluate Research

Presenting Papers
Reading Papers
Reviewing Papers
Assignments

Read and review at least 2-3 papers / class period (every week)

   At beginning of quarter, answer mostly *what they did*

   By mid-quarter, critically review *whether they did it well*

Choose and present a paper, every n/2 class periods, where n is the number of students in the class
Choosing a Paper

CHI, SIGCSE, ICER

Experimental - must have users and a study design
Initial Critique Focus

1. Flawed Study: Study design and/or data analysis did not test whether design worked for a narrow population.
2. Small Narrow Study: Study design and/or data analysis tested whether design worked for a narrow population but was too small to generalize.
3. Narrow Study: Study design and/or data analysis tested whether design worked for a narrow population.
4. Small Broad Study: Study design and/or data analysis tested whether design worked for a broad population but was too small to generalize.
5. Broad Study: Study design and/or data analysis tested whether design worked for a broad population.
In-class Activities

Discuss papers

What was their idea?

How did they analyze it?

What do you think about it? Do you think it would have worked for you? (why or why not)

How does it relate to other things we’ve / others have read?

In groups, you answer the following question

What makes papers successful in ___________ (enter attribute here)?

What are the limitations in the research design?

What are next research steps?
Grading

30% Paper reviews
20% Presentations (Weight increases later in the class)
50% In-class attendance & participation
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 are limitations on sharing’s benefits?

- Our group is not representative - echo chamber
- Tend to weigh anecdotes over published research
What classroom environment do we want? (attributes of a positive environment)

- Inclusive - everyone in the class feels they belong
- Feeling like you can say whatever’s on your mind, any topic*
  - Be mindful of how your rhetoric can affect other people
- Feeling like the ideas you share are being heard and taken into account
- Disagreements can be respectful and not taken personally*
  - Disagree with the idea, not the person (be careful with language)
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?

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<th>Helpful words / actions</th>
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What classroom environment do we want?

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<tbody>
<tr>
<td>Listening</td>
<td>Overly negative feedback</td>
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<td>Acknowledging merits of comment before criticizing</td>
<td>Not responding to comment - changing subject</td>
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<td>Awareness of different fields</td>
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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 papers, you may choose any paper from CHI (main conference)
Readings for Next Class

Efficiency of Learning from Proof Blocks vs Writing Proofs
https://dl.acm.org/doi/10.1145/3545945.3569797

Using Foundational CS1 Curricula for Middle School & Early High School Computer Programming Education
https://dl.acm.org/doi/10.1145/3545945.3569877

It is in gradescope already!! Let me know if you haven’t been added to Gradescope for the course!

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Paper choosing / presenting assignments

Thursday 3/23 - Diana
Send me paper choices by Thursday 3/23 5pm

Tuesday 3/28 - J.L.  D.M.

Thursday 3/30 - S.N.  M.T.
Send me paper choices by Thursday 3/30 5 pm

Tuesday 4/4 - _________  ________

Thursday 4/6 - _________  ________
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
Anti-Constructivism: Sage on the Stage
Constructivism

1. People understand through lens of existing knowledge
   a. The world is round - like a pancake or a ball?
2. They are active participants in building their knowledge / creators of knowledge
Designing Curriculum: Theory: Constructivism
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Designing Curriculum: Theory: Constructivism
Anti-Constructionism:
Constructionism:

1. Constructing something
2. Personally meaningful, self directed
3. Public sharing of artifact

Similar ideas outside of CS Ed?

Inquiry-based learning
Open-ended projects
Cognitive Load Theory

Your mind:

- Has a limit on information
- Filters information

Instructional interventions should limit the amount of information so it doesn't fill up working memory

Which is easier?

Two additional features

Visual and Auditory information do not compete (“Modality Effect”) - better to narrate than add clutter to diagram

Learned information in scheme treated as a single grouped item. Therefore, mastery before new things is better than learning many new things at once.
CLT Education Guidance

Adapt Presentation to Expertise

Reduce the Problem Space (amount to learn)

Integrate pieces of information rather than presenting separately

Take advantage of auditory + visual channels
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Efficiency of Learning from Proof Blocks vs Writing Proofs
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Designing Effective Interview Chatbots: Automatic Chatbot Profiling and Design Suggestion Generation for Chatbot Debugging
https://dl.acm.org/doi/10.1145/3411764.3445569

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