Large Lectures in Calculus:
A challenge in Teaching and Research

S.I.G.M.A. Seminar

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Outline

- Large lecture issues
- Three technological tools
- Preliminary Students’ Perceptions
- Research process
What do student think?

If you had a choice, would you chose to enroll in a mathematics class in large lecture format?
Large lecture issues

1. 150+ students versus 32 students.
3. Invisible versus Visible.
4. Uninvolved versus Involved.
5. Chaos versus Order.

Savkar & Cardetti

Large Lectures in Calculus
Challenges

1. Student - Teacher interaction.
2. Are students on the same page as you? In-class interaction.
3. Organize study material.
Micro-videos

- Decide on a topic or concept.
- You need a white or black board.
- A handheld camera.
- A well lit room.
- Software to process the video.
- A server to host it. Click here
Interactive Response Systems: “Clickers"

- Prepare questions in advance.
- Be prepared to ask follow up questions.
- Key is in the response.
- Good questions leads to insightful data.
- Iterative process.
- Post them online
Flash Cards

- Pick concepts, formulae, identities etc.
If you had a choice, would you choose to enroll in a mathematics class that provides online Micro-videos?
Preliminary Students’ Perceptions

If you had a choice, would you choose to enroll in a mathematics class that uses Interactive Response system (Clickers)?
Preliminary Students’ Perceptions

If you had a choice, would you choose to enroll in a mathematics class that provides electronic Flashcards?

- Definitely No: 2
- Probably No: 3
- Not Sure: 16
- Probably Yes: 37
- Definitely Yes: 43
Research Process

1. Preliminaries
2. Study Design
3. Preparations and Implementation
4. Data Analysis and Interpretation
5. Dissemination
Preliminary steps

- Research Problem
- Purpose
- Literature Review
- Research Question

Research Problem

A general problem, issue, or concern
Stands on its own
Preliminary steps

- Research Problem
- Purpose
  - Literature Review
  - Research Question

Purpose

Major intent of the study to address the problem
Narrows research problem down to a specific aspect
Preliminary steps

- Research Problem
- Purpose
- Literature Review
- Research Question

Literature Review

Justify the research problem and purpose
Summarize present state of knowledge
Identify deficiencies in the evidence
Interface between Purpose and Research Question
<table>
<thead>
<tr>
<th>Preliminary steps</th>
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</thead>
<tbody>
<tr>
<td>• Research Problem</td>
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<tr>
<td>• Purpose</td>
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<td>• Literature Review</td>
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<table>
<thead>
<tr>
<th>Research Question</th>
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<tr>
<td>Specific Question(s) to be addressed in the study</td>
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</table>
Design Approaches

Research question determines the design approach

- Quantitative Study
- Qualitative Study
- Mixed Methods Study

Quantitative

Experimental research
Correlational research
Survey research
Design Approaches

Research question determines the design approach

- Quantitative Study
- Qualitative Study
- Mixed Methods Study

Qualitative

Grounded Theory research
Ethnographic research
Narrative research
Design Approaches

Research question determines the design approach

- Quantitative Study
- Qualitative Study
- Mixed Methods Study

Mixed Methods

Combination of quantitative and qualitative approaches to best understand and explain the research problem
Preparations

- Institutional Review Board (IRB)
- Honoring research sites
- Instruments (surveys, interview guides, observation rubrics)

Research on human subjects

IRB → protecting the rights of participants
UConn IRB
Preparations

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- Honoring research sites
- Instruments (surveys, interview guides, observation rubrics)
Preparations

- Institutional Review Board (IRB)
- Honoring research sites
- Instruments (surveys, interview guides, observation rubrics)
Preparations specific to our study

- IRB protocol submission and approval
- Course Coordinator approval
- Preparation of all instructional materials and surveys
- Formatting, editing, uploading, and testing web-based tools
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Implementation

- Information sessions for participants
- Data collection
- Monitoring
Implementation

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- Data collection
- Monitoring
Large Lectures in Calculus

Implementation

- Information sessions for participants
- Data collection
- Monitoring
Data analysis and interpretation

During or immediately after data collection

- Data analysis (type of data)
- Results interpretation → restricted to data findings
- Discussion and Conclusion
Data analysis and interpretation

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Data analysis and interpretation

During or immediately after data collection

- Data analysis (type of data)
- Results interpretation → restricted to data findings
- Discussion and Conclusion
Reporting results

- Audience
- Type of Report
- Adhere to specific requirements
Reporting results

- Audience
- Type of Report
- Adhere to specific requirements
Reporting results

- Audience
- Type of Report
- Adhere to specific requirements
Special thanks
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and
Provost’s Office
THANK YOU!

Questions?