Motivational effects of hands-on, problem-based, and lecture activities in an introductory college course

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Introduction

Active Learning Works

- Active learning widely demonstrated to improve student interest, motivation, and achievement
- Important implications for college introductory courses

Hulleman and Harackiewicz, 2009

Active learning works: *now what?*

- Active learning encompasses a wide variety of methods[1]
- Little research on specific course activities[1]
- Existing research on specific activities obscures important variation[2]

[1]Chi and Wylie, 2014
[2]Bernstein, 2018

"2nd generation" active learning research

- Empirical work on specific activities
- Description of activity features
- Analysis of underlying processes
- Elimination/examination of moderating effects

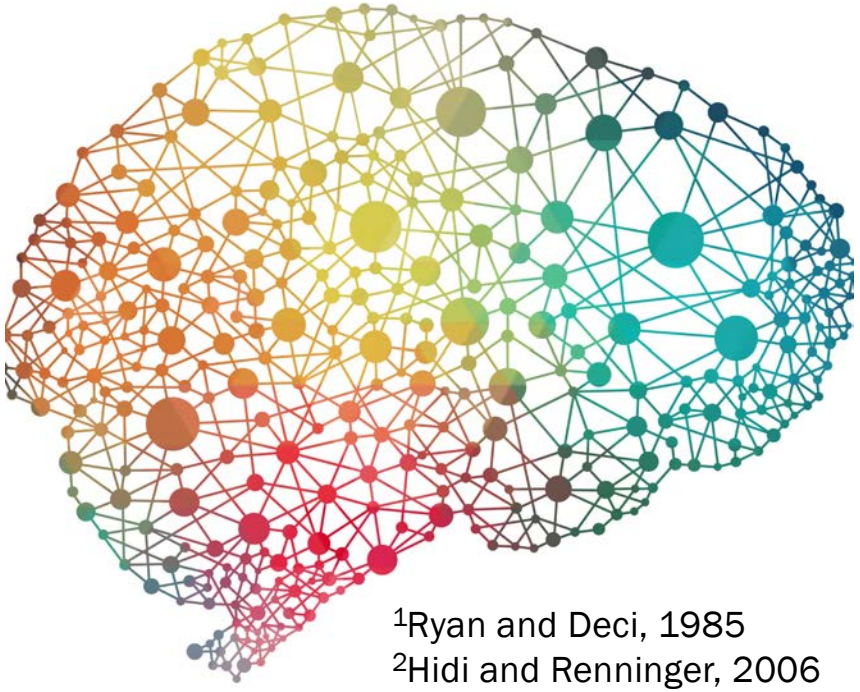
Active learning: underlying processes

Motivation

- The process that initiates, guides, and sustains goal-directed behavior[1]

Interest

- An emotion that drives exploration and focuses attention[2]



[1]Ryan and Deci, 1985
[2]Hidi and Renninger, 2006

Motivation is a spectrum

Intrinsic (internalized)

Interest/Enjoyment
Purpose, passion
Connection with values/identity

Extrinsic (external)

Rewards/punishment
Social acceptance
Praise
Grades, promotion

Ryan and Deci, 1985

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Ryan and Deci, 1985

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Harnessing intrinsic motivation and interest to improve educational outcomes

Many types of motivation important in educational settings[1]

Interest, intrinsic motivation enhance learning, performance, and achievement[2]

- Enhance attention, recall, task persistence, effort[3]
- Associated with well-being[4]

[2]Hidi, 1990; [3]Ainley, Hidi, and Berndorff, 2002
[4]Deci and Ryan, 1985

The Present Study

Research Questions

- How do video lecture, laboratory station, and case study activities affect students' situational motivation and situational interest?

Participants

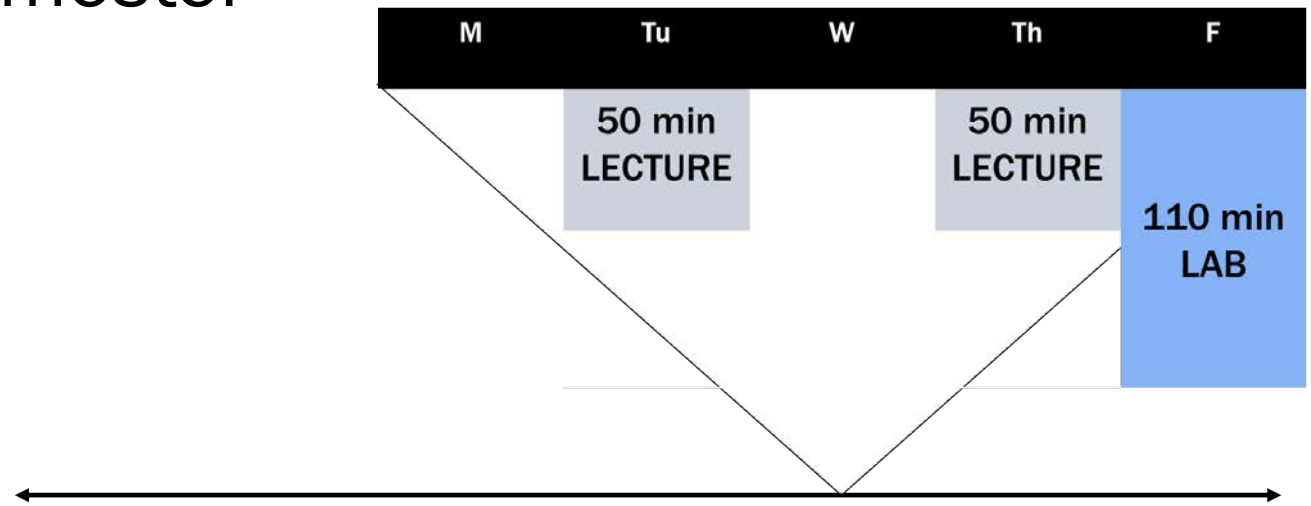
- 178 students enrolled in introduction to animal agriculture
  - Overall response rate: 94.4%

- Predominantly
  - first-year
  - ANSC-major
  - female

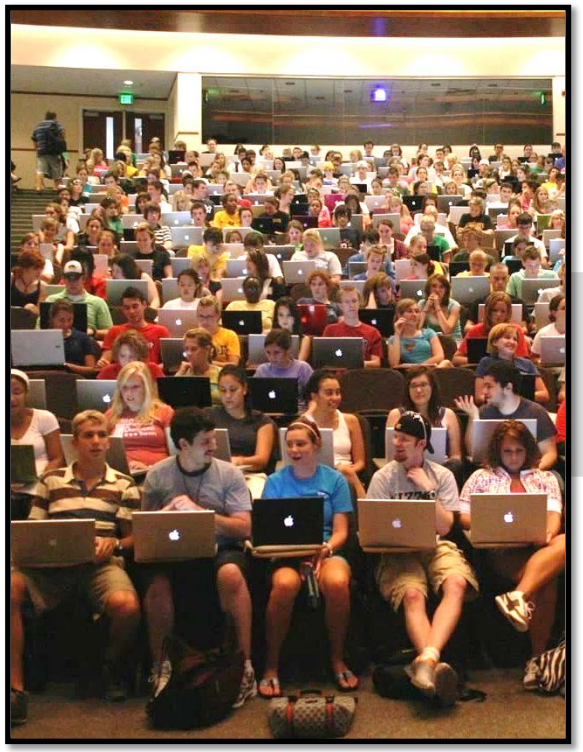
Context

16wk Introduction to Animal Agriculture

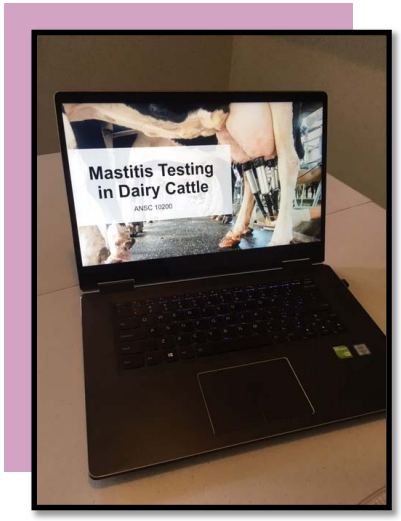
Fall 2018 Semester



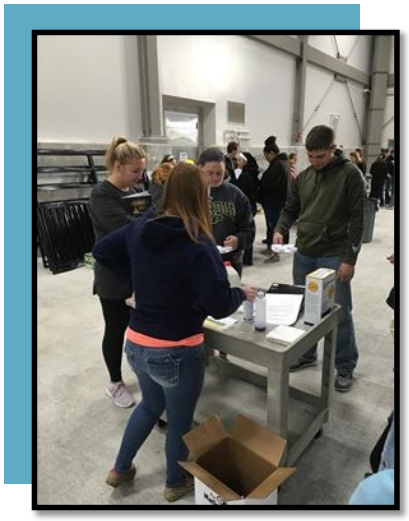
Fall ‘17: Restructured to Active Learning



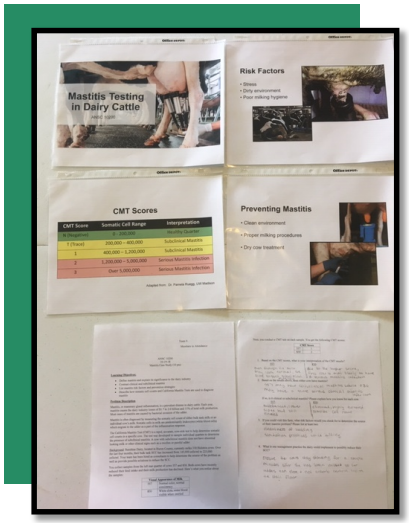
A cross-section of course activities



Lecture



Lab Station



Case Study

Method

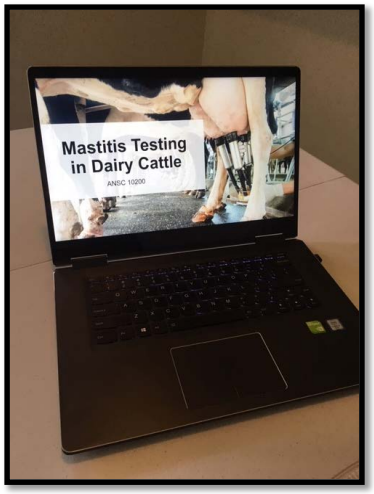
Study Design

- IRB Approved
- Quantitative
- Latin Square Design

Instrumentation

- Situational Intrinsic Motivation Scale (SIMS)[1]
- Situational Interest Scale (SIS)[2]

[1]Guay, 2000
[2]Chen et al., 1999



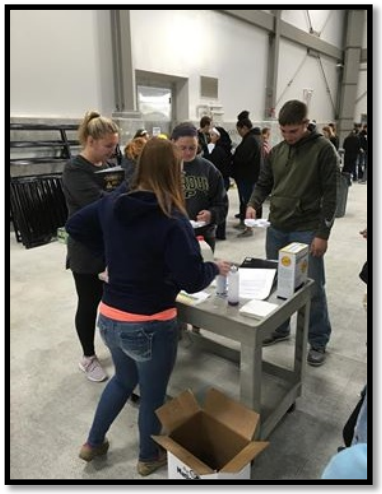
Lecture

Independent

Passive

Watch slides

Listen to instructor



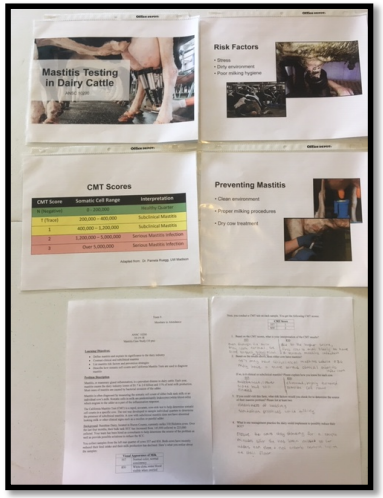
Lab Station

Groups of 5-7

Problem-based

Hands-on scenario

Instructors guide



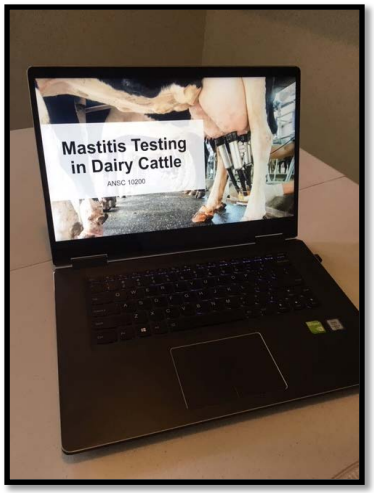
Case Study

Groups of 5-7

Problem-based

Written scenario

Instructors guide



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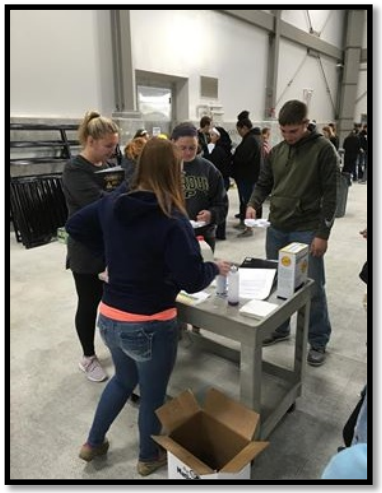


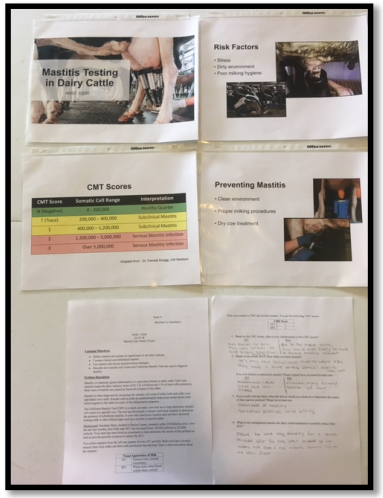
Lab Station

Groups of 5-7

Problem-based

Hands-on scenario

Instructors guide



Case Study

Groups of 5-7

Problem-based

Written scenario

Instructors guide

Study Design

Group #	Period 1	Period 2	Period 3
1	Lecture	Case Study	Lab Station
2	Lab Station	Lecture	Case Study
3	Case Study	Lab Station	Lecture
4	Lecture	Case Study	Lab Station
5	Lab Station	Lecture	Case Study
6	Case Study	Lab Station	Lecture

Study Design

7:30	9:30	11:30	1:30	3:30
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6

Verbal Instructions
(5 mins)

Assigned Activity
(10 mins)

Questionnaire
(10 mins)

Weeks 7, 9, 10

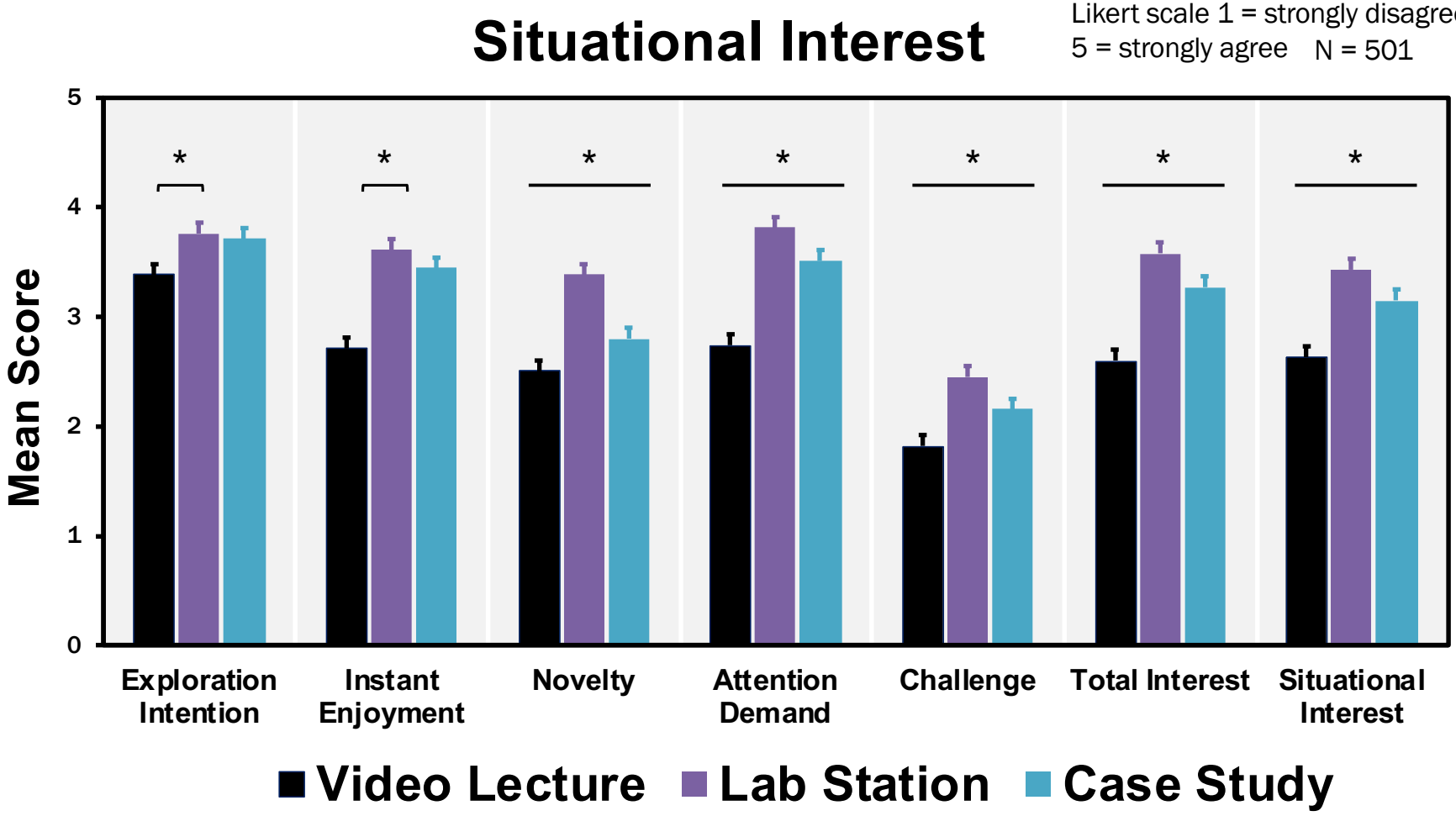
Statistical Analysis

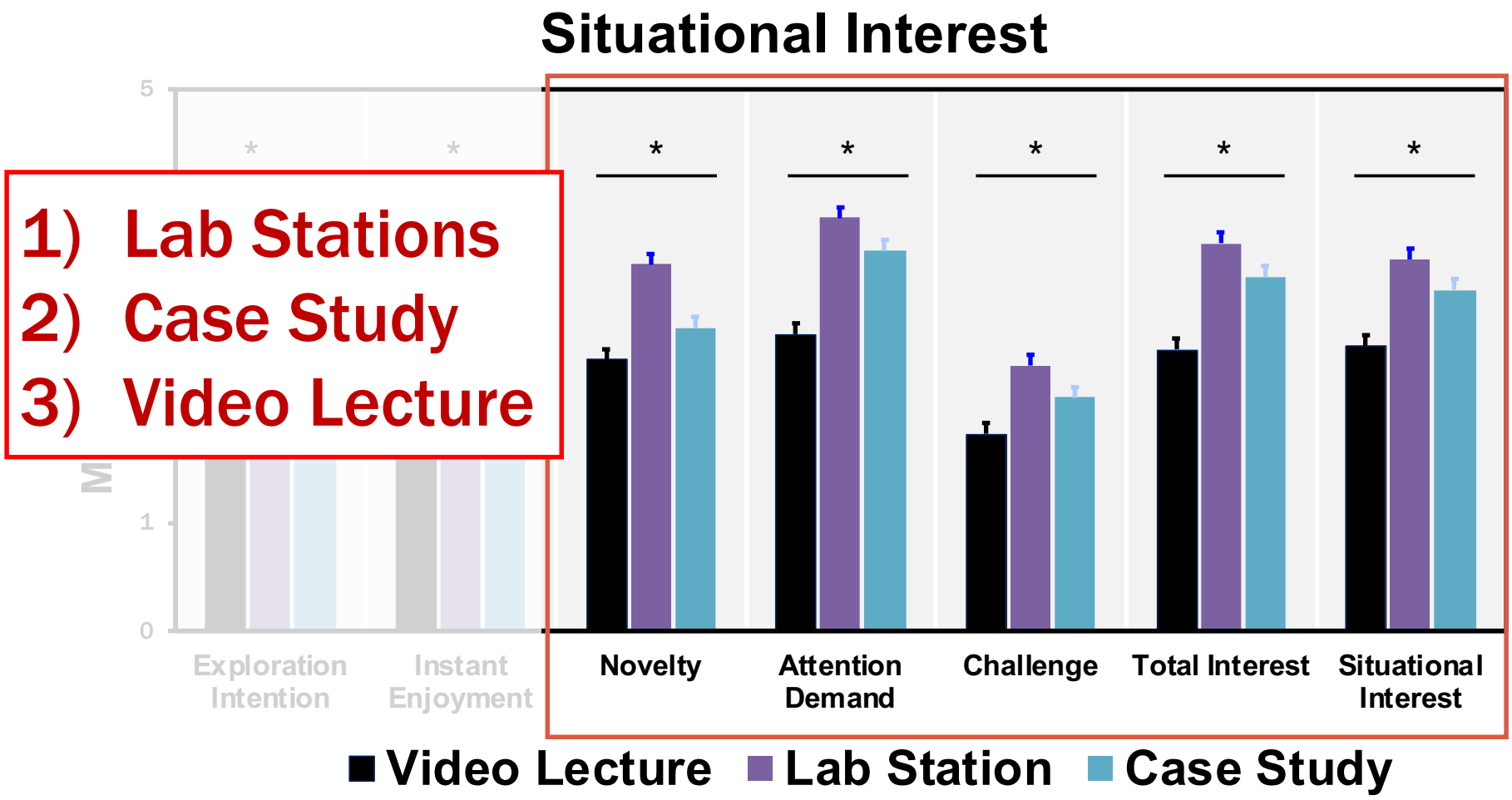
- SAS Software
- Significance declared at $p<0.05$
- UNIVARIATE procedure
- MIXED procedure

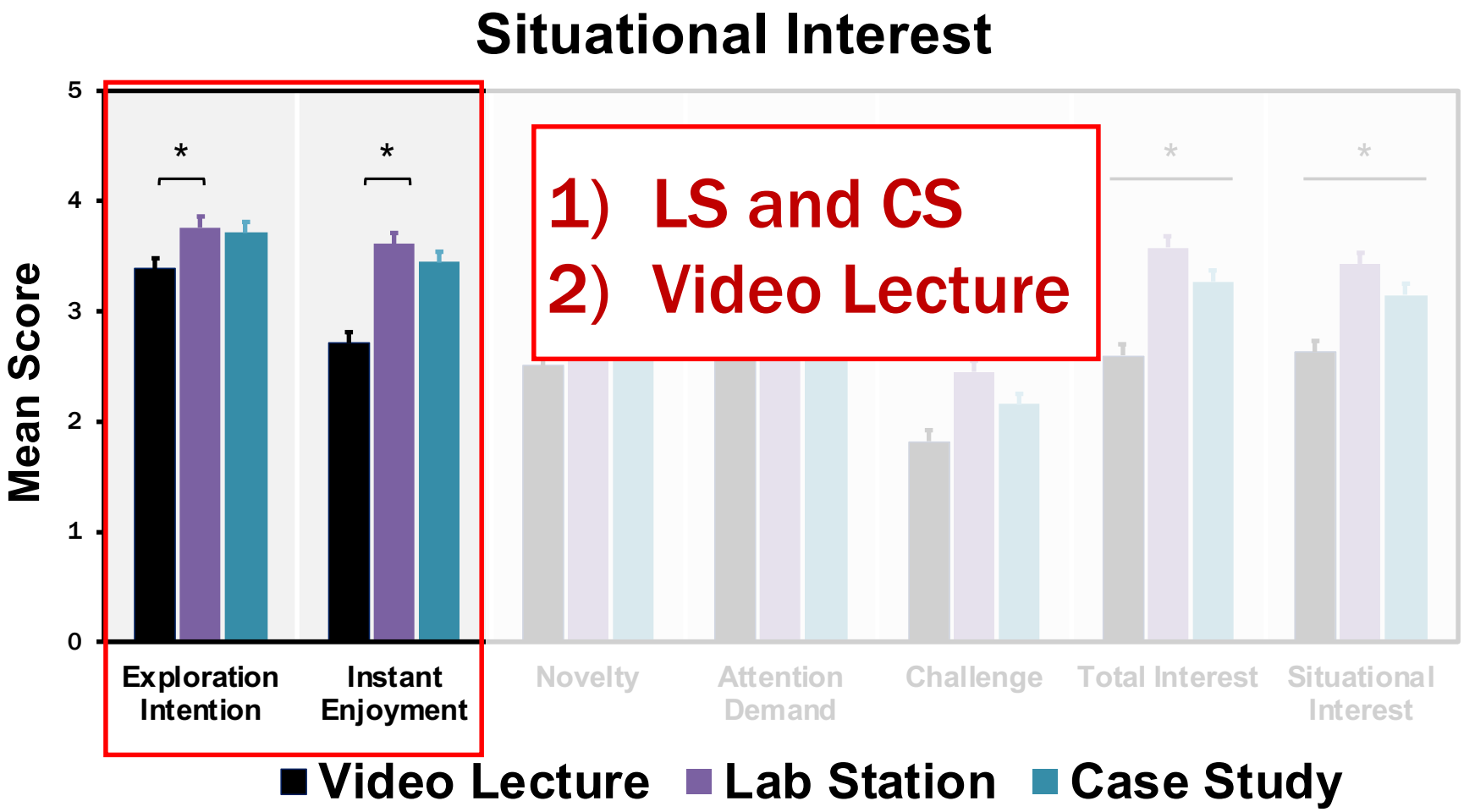
Results

Data presented are LSM±SEM

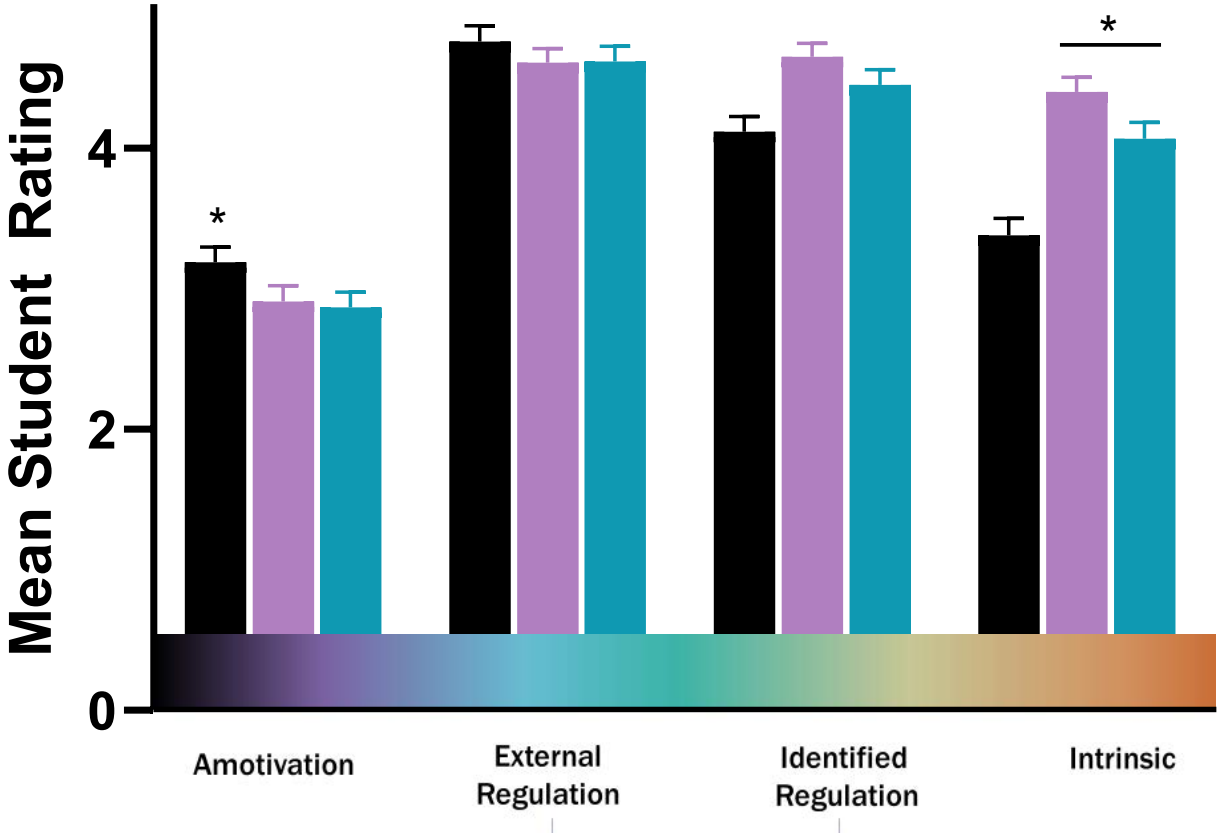
Likert scale 1 = strongly disagree, 5 = strongly agree N = 501




Situational Interest
1) Lab Stations
2) Case Study
3) Video Lecture
5
1
0
Exploration Intention
Instant Enjoyment
Novelty
Attention Demand
Challenge
Total Interest
Situational Interest
Video Lecture
Lab Station
Case Study


Situational Interest
Mean Score
5
4
3
2
1
0
*
*
*
*
1) LS and CS
2) Video Lecture
Exploration Intention
Instant Enjoyment
Novelty
Attention Demand
Challenge
Total Interest
Situational Interest
Video Lecture
Lab Station
Case Study

Situational Motivation



Video Lecture

Lab Station

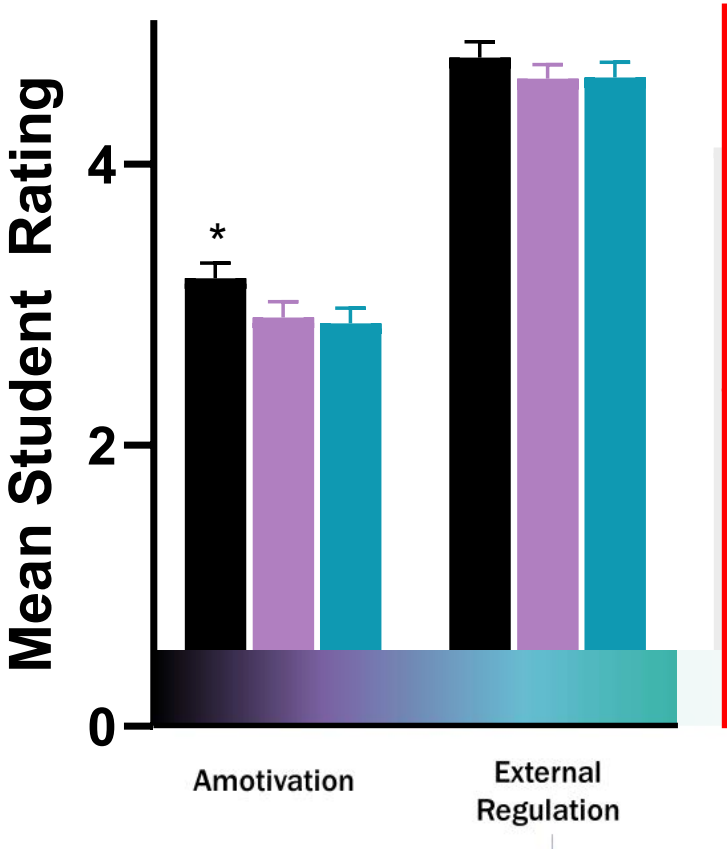
Case Study

Data presented are LSM±SEM

Anchored scale
1 = not at all
7 = exactly

N = 501

Situational Motivation



AMOTIVATION

1) **Video Lecture**
2) **LS and CS**

EXTERNAL REG.

no differences

ideo Lecture

ab Station

ase Study

sented are LSM±SEM

d scale
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tly

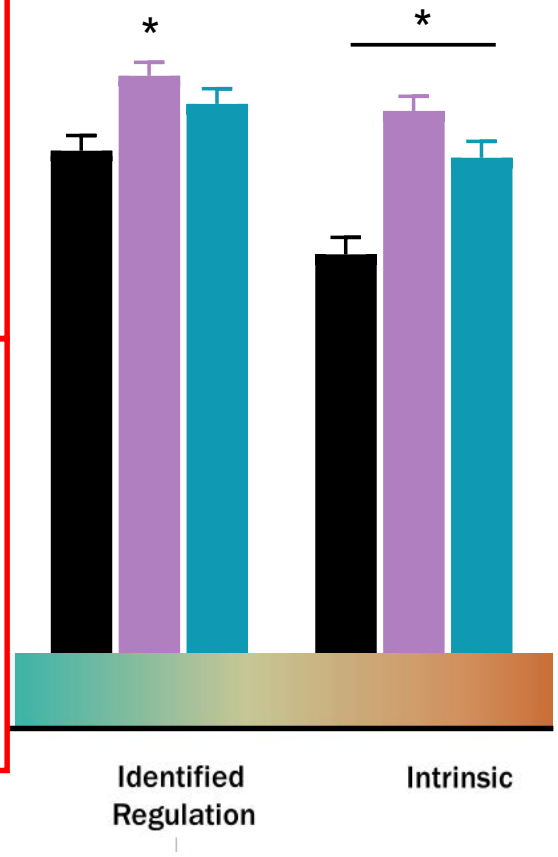
Situational Motivation

IDENTIFIED

1) LS and CS
2) Video Lecture

INTRINSIC

1) Lab Stations
2) Case Study
3) Video Lecture



Video Lecture
Lab Station
Case Study

Data presented are LSM±SEM

Anchored scale
1 = not at all
7 = exactly

N = 501

Conclusions

Conclusions

Problem-based and hands-on learning activities in this course improve **situational interest, intrinsic motivation**

Problem-based, hands-on activities appeared to connected more with students' values, interests, enjoyment compared with video lecture activities

Limitations

Aggregating group data

Limited population, timeframe

Personal, context factors

Future Directions

- Personal factors:
  - Prior experience and attitudes toward active learning
  - Motivational traits and orientations
- Contextual factors (e.g. group dynamics)
- Performance outcomes
- Other activities

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- Student and teaching assistant participants
- Undergraduate research assistants

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  - Jacie Grant
  - Danielle Marks

Thank You!

Questions?

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