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# Student-Teacher Affect in STEM College Course Transformation

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## **Abstract for DBER Group Discussion on 2016-02-25**

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### **Title**

Student-Teacher Affect in STEM College Course Transformation

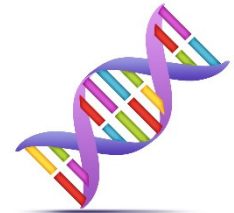
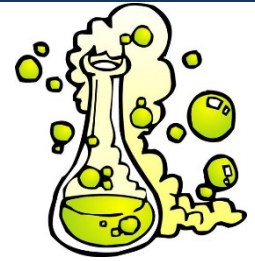
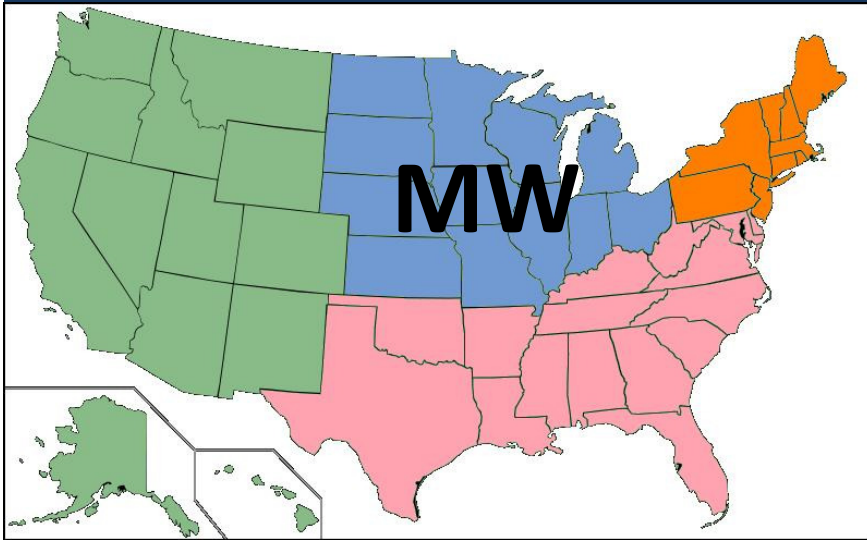
### **Abstract**

Despite federal efforts to support the propagation of active-learning strategies in introductory college science, technology, engineering, and mathematics (STEM) courses, instructor adoption of these strategies lags behind the published research that touts their efficacy for students' learning. Possible reasons for this lag are varied and, herein, we investigate the potential role that students play in STEM instructors' decisions on whether and how to adopt active-learning strategies. Our study was conducted at a large public university in the Midwest. Grounded in social cognitive theory, we use a mixed methods approach that combines 34 classroom observations, one-on-one interviews with students (n=57) and instructors (n=12), and online surveys of students (n=301) and instructors (n=12). We find that students pose impediments to adopting active-learning strategies, but faculty-perceived impediments related to time and reward outweigh them. In addition, we find that students also provide the motivation behind instructors' decisions to adopt active-learning strategies. The majority of students in this study indicate that they want more active-learning experiences in the classroom, and the instructors indicate that they want to provide students with more active-learning experiences, engage with them, and see their growth as learners, yet find it difficult to motivate students. Given the instructional support and time needed to develop and implement courses based on active-learning strategies, we present implications and recommendations to support the transformation of introductory college STEM courses that can inform departmental, college, and university efforts to enhance students' learning and academic experience.

# Student-Teacher Affect in STEM College Course Transformation

Matthew T. Patton & Leilani Arthurs  
University of Nebraska-Lincoln  
DBER STEM Education Seminar  
February 25, 2016

# Introduction



## From the literature, we know that...

Across STEM disciplines, active learning increases exam scores and raises average grades by a half letter grade.

*Freeman et al, 2014*

Research-based instruction, including active engagement, increases student learning.

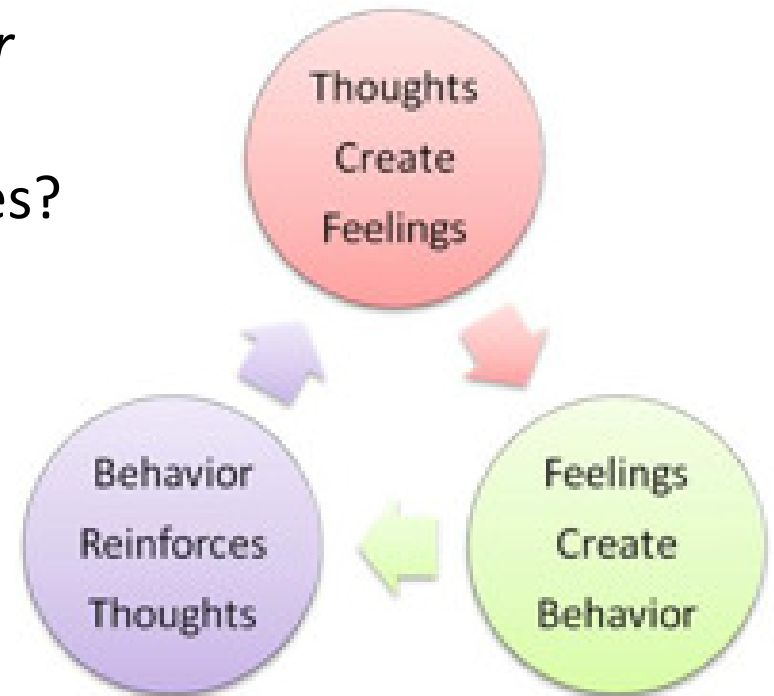
*Deslauriers et al, 2011*

Instructors consistently interacting with students results in increased student academic engagement.

*Gasiewski et al, 2012*

# Research Questions

1. To what extent does *student behavior* related to the course influence instructional decisions and/or changes?



2. To what extent does *student thinking* about teaching influence instructional decisions and/or changes?

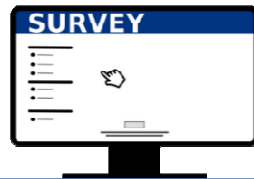
# Methods

Key:

B=start of the semester

M=mid semester

E=end of semester



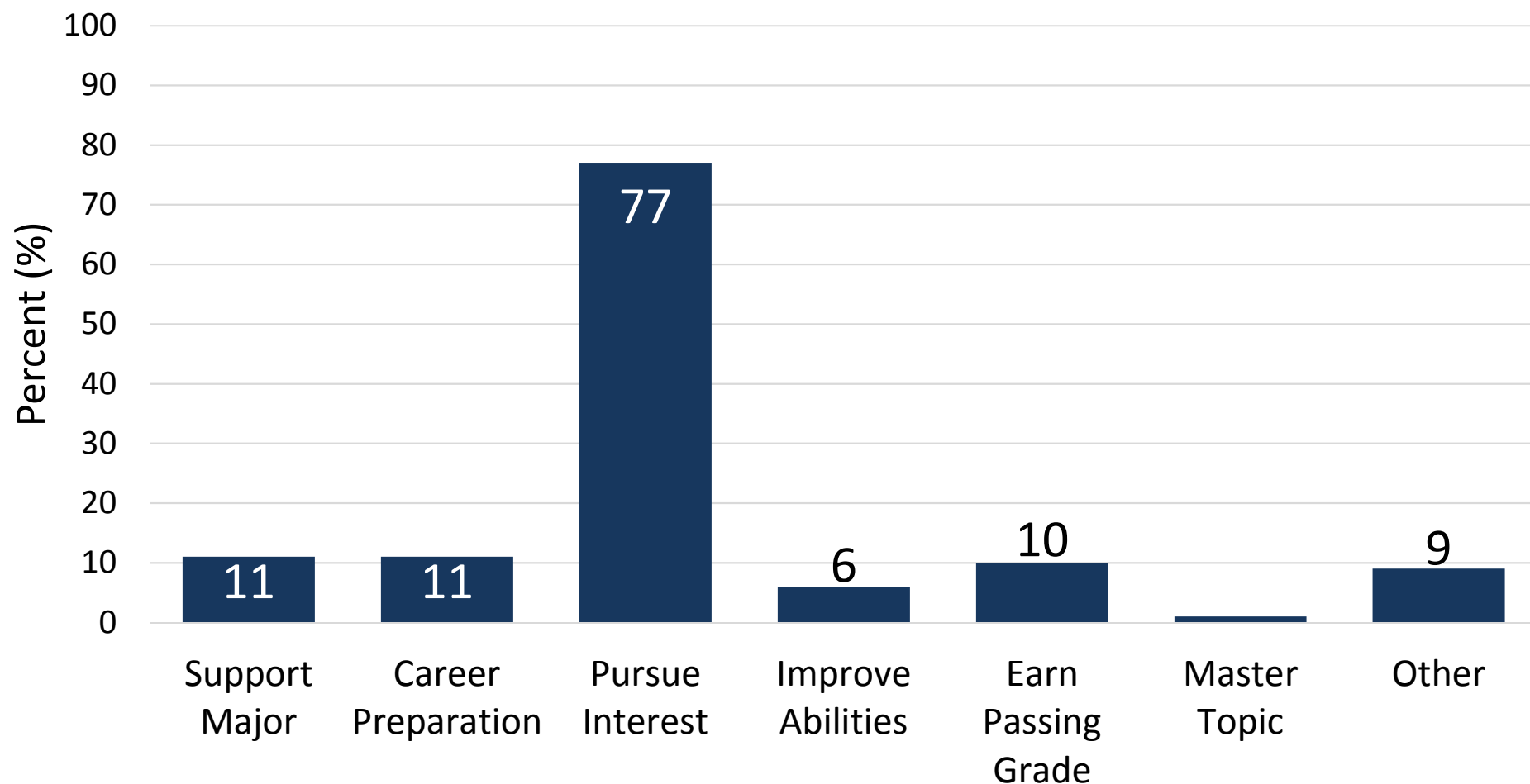
	Online Surveys	Individual Interviews	Classroom Observations
Faculty	B (n=12)	B, M, E (n=12)	--
Student	E (n=401)	E (n=57)	--
Class observations	--	--	B, M, E (n=34)



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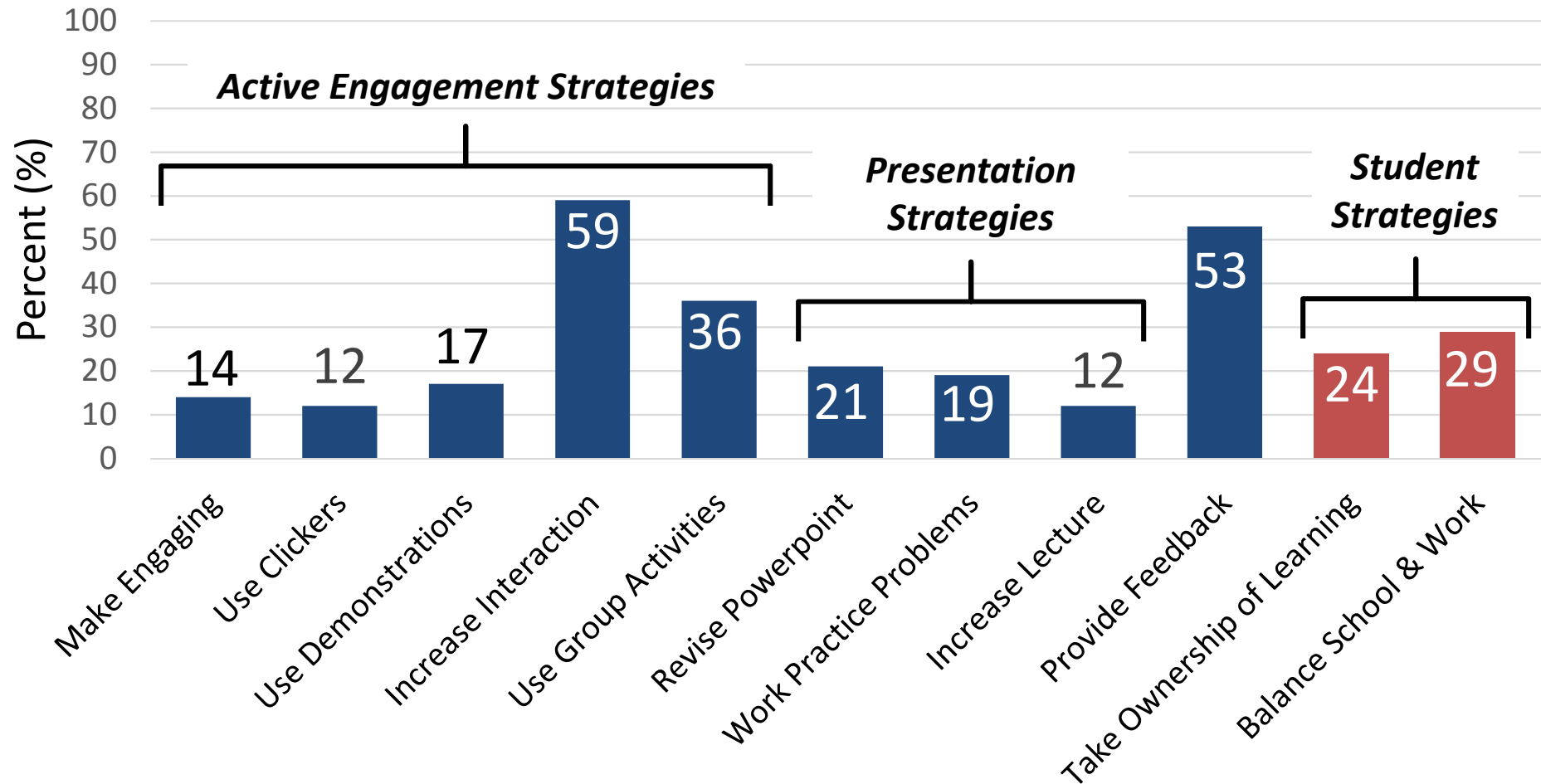
# Students expect large introductory-level STEM courses to serve them in some way.



**n=294 student surveyed**

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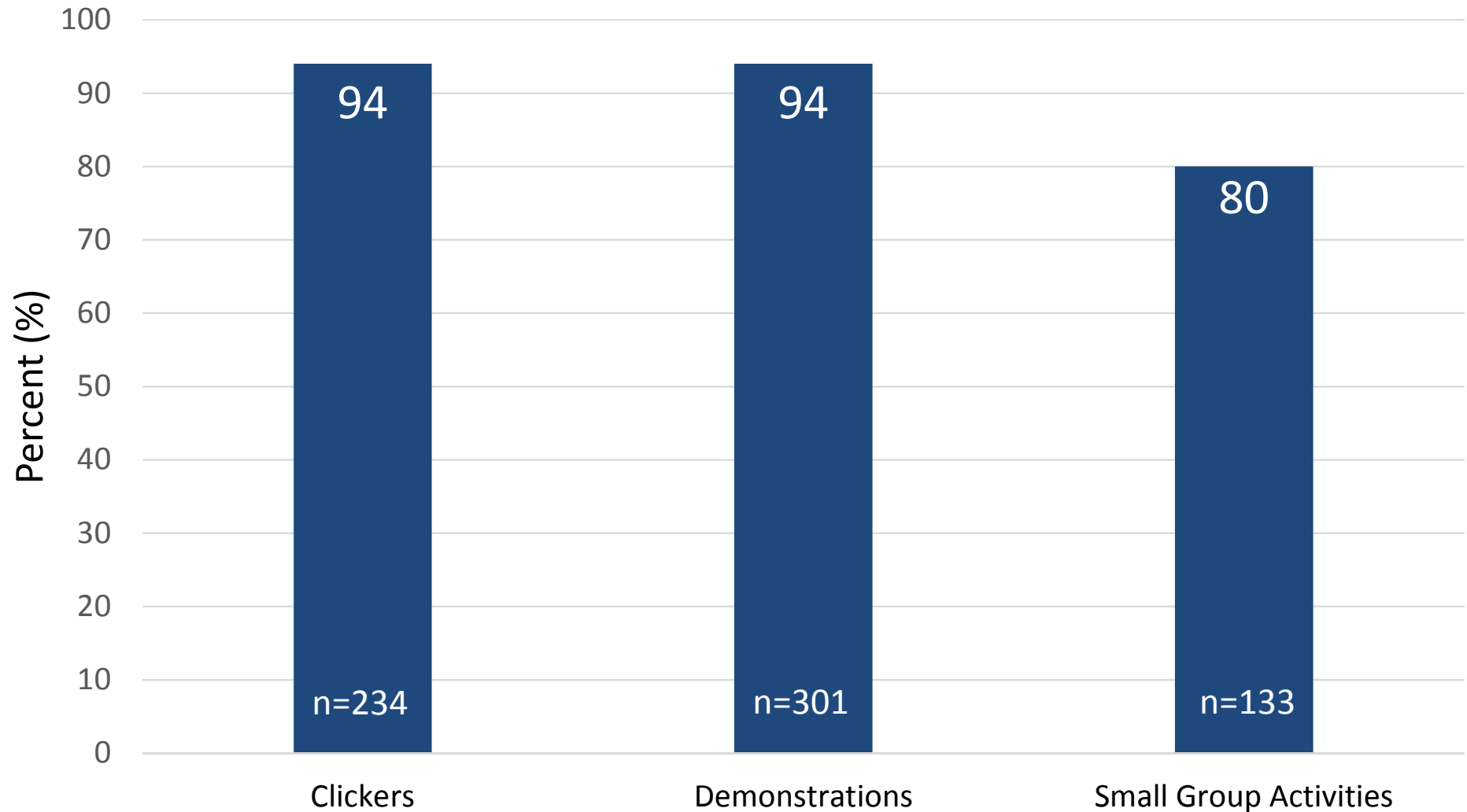
# Students recommend improving the learning experience in large introductory STEM courses.



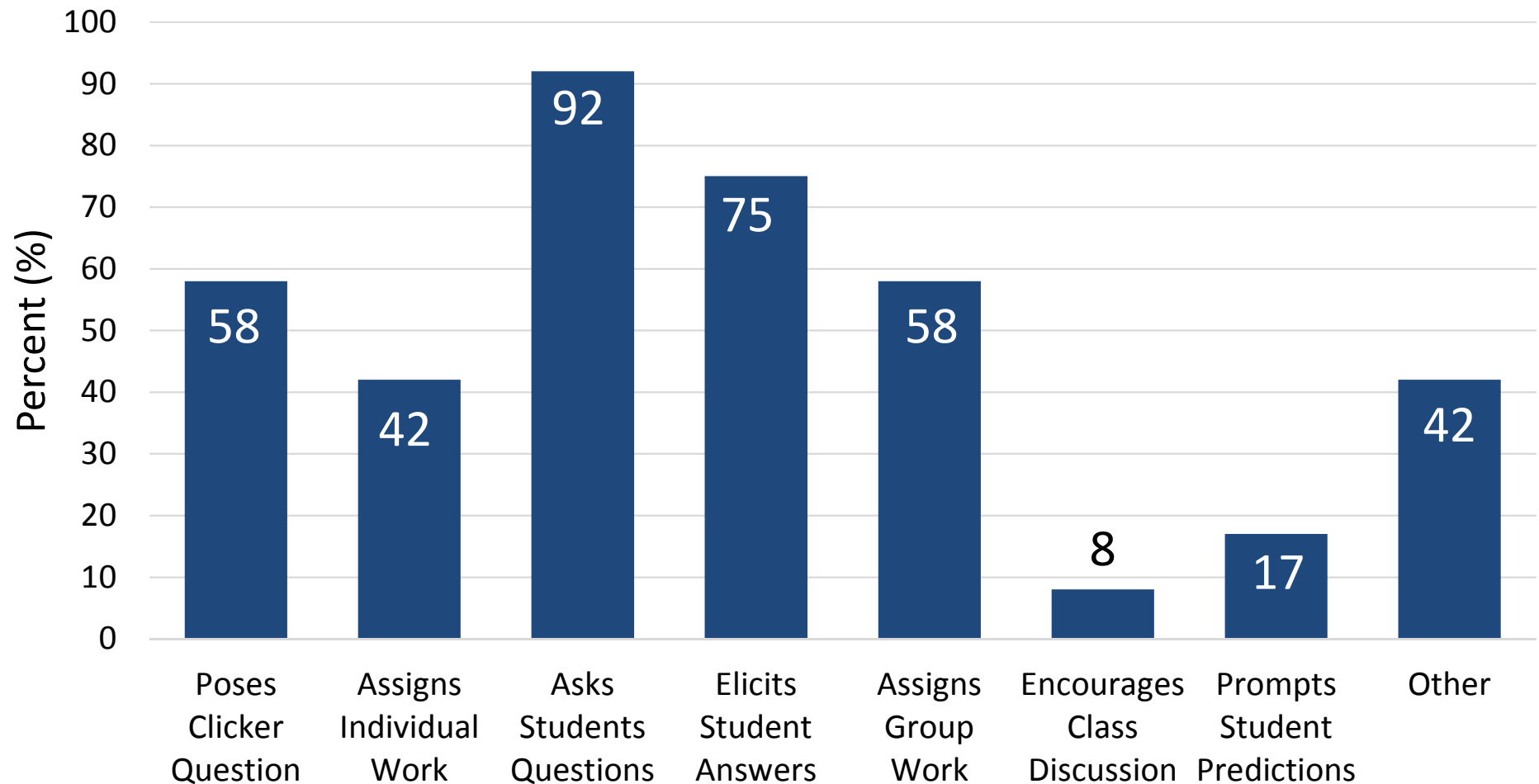
n=57 students interviewed

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Students find active learning strategies helpful to their learning experience.



# Faculty use active learning strategies to help meet student expectations of what they want to get out of the course ...



**n=12 instructors**

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... and 75% (9/12) of them use student feedback to inform instructional decision-making.

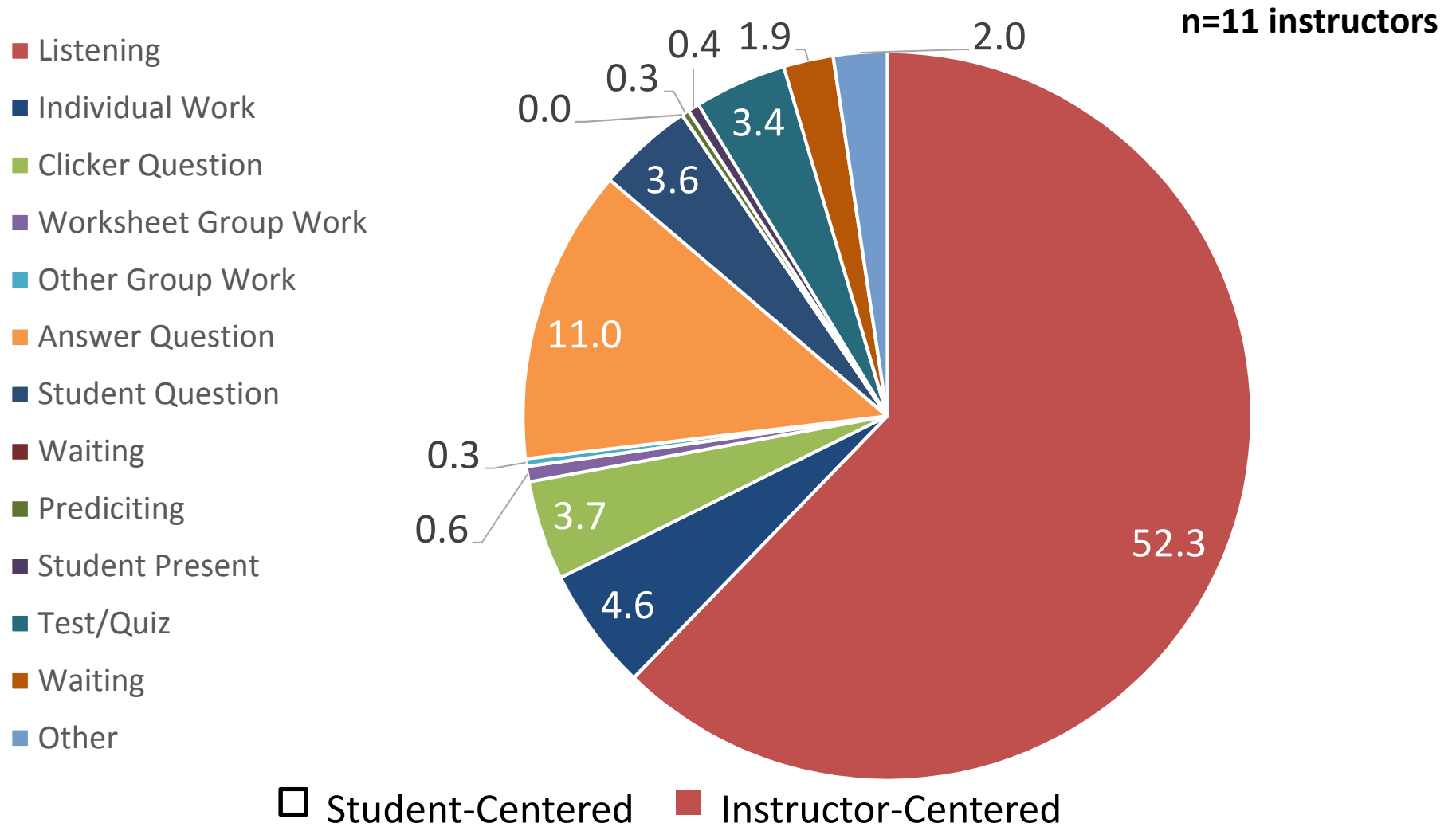
**Instructor A:** *When the bulk of students don't get it, I will **try to find another way to help get the content across** and/or send them out with advice to read book, work problems, and ask questions.*

**Instructor B:** *We just read some clicker [answers] and it was immediately clear that they had misunderstood a key concept so we went back and **went over it again**.*

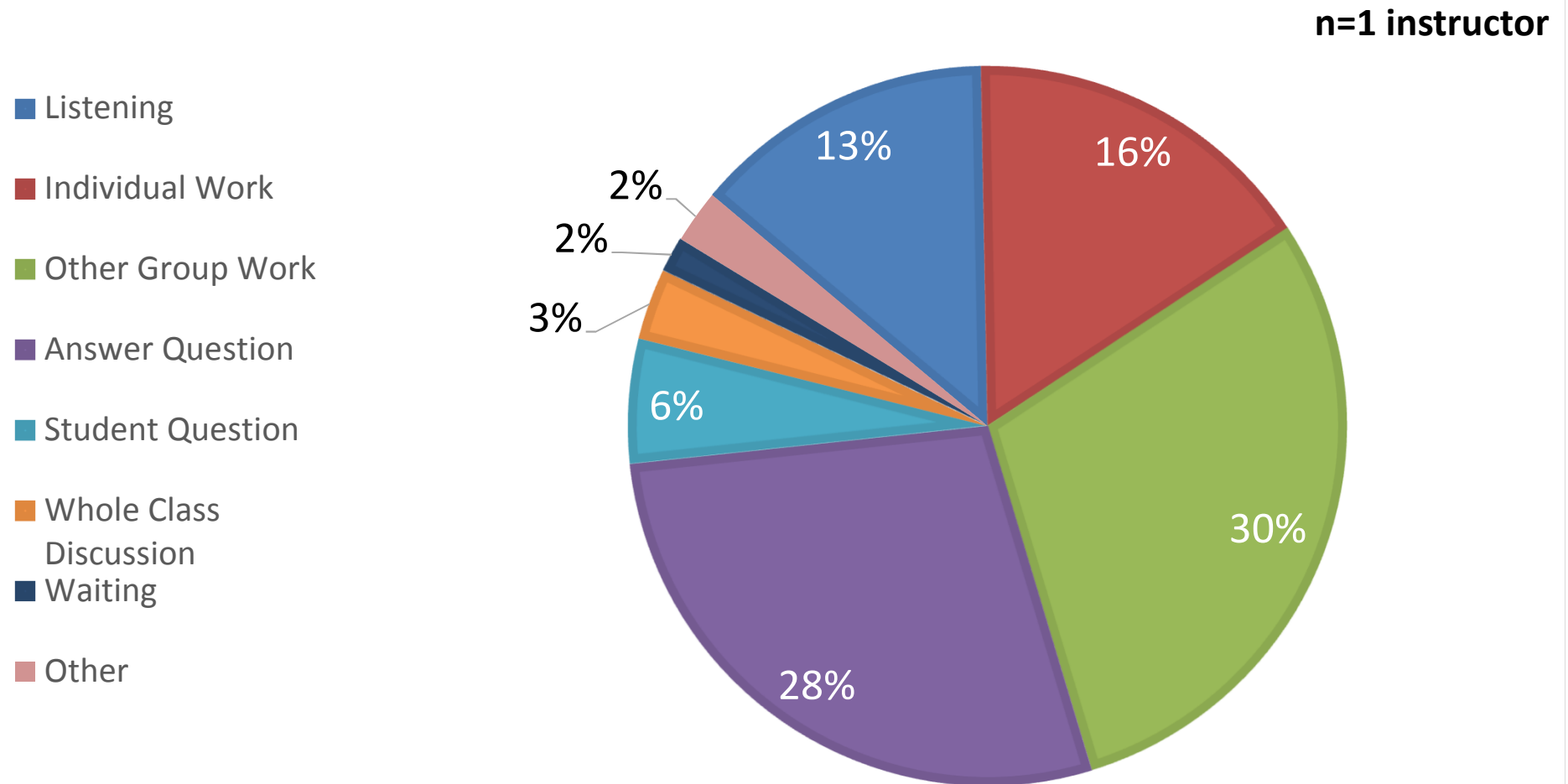
**Instructor C:** *I often use student feedback (questions) to guide me in **strategy selection** [lecture, group exercises, examples].*

**Instructor D:** ***Just by answering someone's question** or bringing up an example or something, you can easily turn that into... what I just call a flash lecture.*

Although 75% regularly use student feedback to inform instructional decision-making, the courses remain largely instructor-centered.

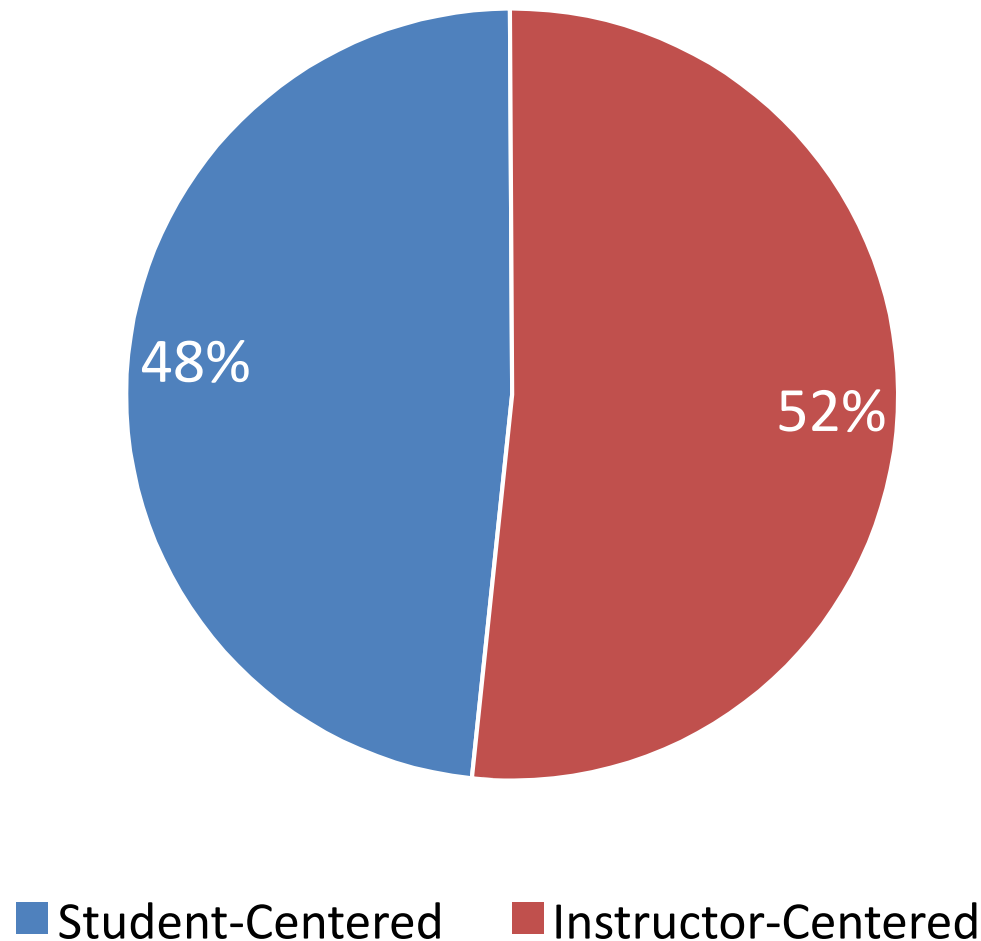


However, one instructor stood out in terms of the nature of the student experience in the classroom.



Although half from Spring '15 regularly use student feedback to inform instructional decision-making, the courses remain largely instructor-centered.

n=12 instructors





A lack of time to design and manage courses hinders faculty from using active engagement strategies.

**Instructor A:** *“TIME. I have tons of ideas for thing I would like to do and **try with the large lecture courses**, but I only have **limited time to develop** new curriculum and investigate new ideas.”*

**Instructor B:** *“**Time** management [**to try** implementing active learning strategies without overloading students].”*

**Instructor C:** *Lecture is effective for **quickly presenting information**.*

**Instructor D:** ***Time** is a limitation, the motivation to incorporate it [formative assessment], I’m getting tired.*



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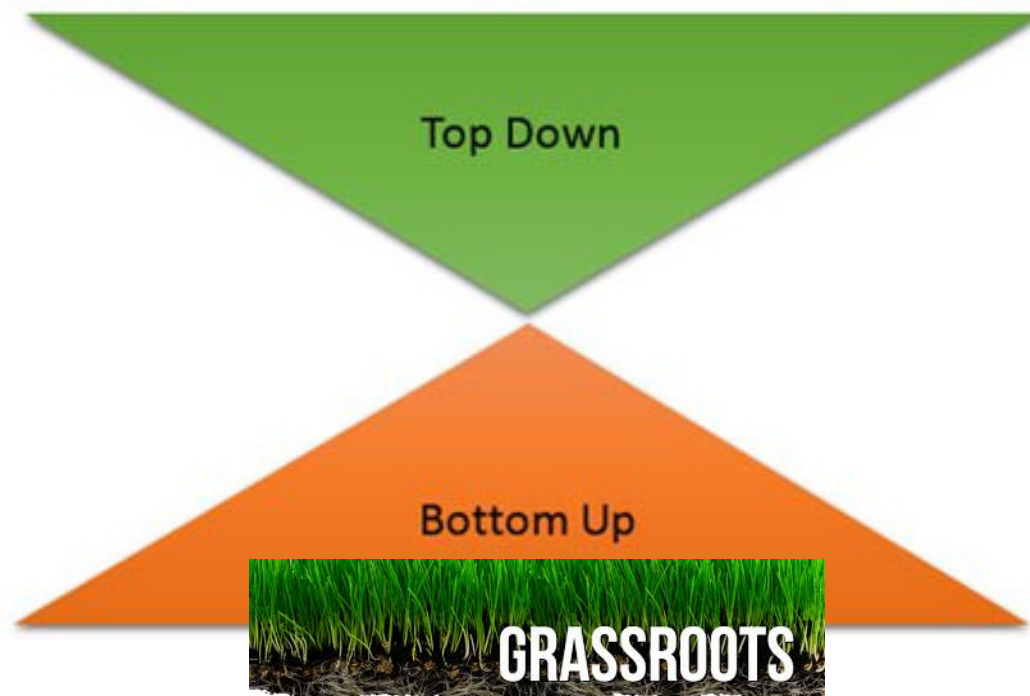
# Key Findings

1. Students want learner-centered classroom experiences.
2. Instructors want to provide learner-centered experiences.



The potential implications of these findings on transforming large STEM courses at this institution include ...

- Students may be able to help promulgate course transformation, from a more grassroots level



## The potential implications of these findings on transforming large STEM courses at this institution include ...

- Students may be able to help promulgate course transformation, from a more grassroots level
- If student demand for learner-centered classrooms grows, then faculty need more time to design and manage courses that incorporate more active learning strategies.
- Faculty will need departmental and institutional support to achieve course transformation.

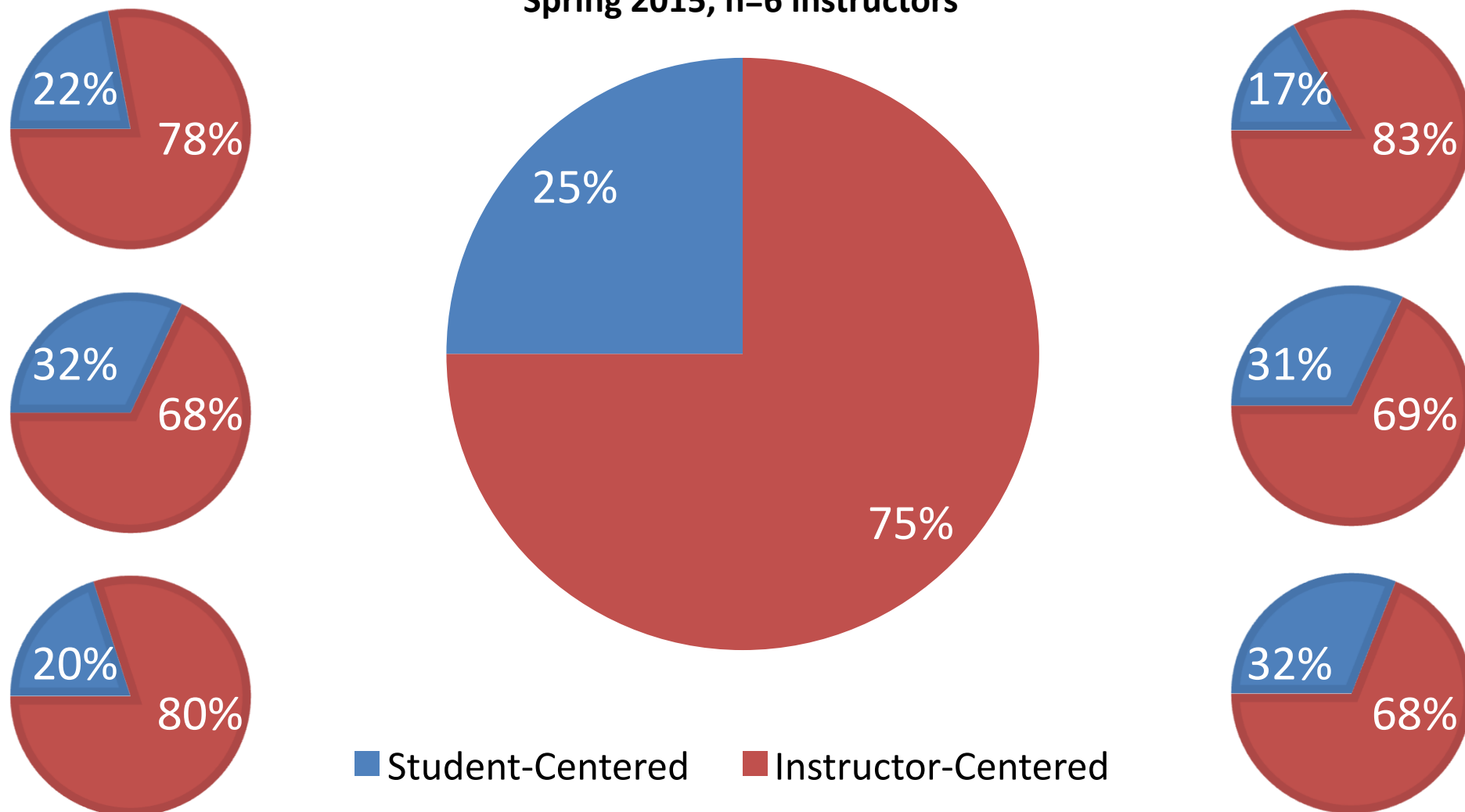
Thank you for listening!

Any questions?



Although half regularly use student feedback to inform instructional decision-making, the courses remain largely instructor-centered.

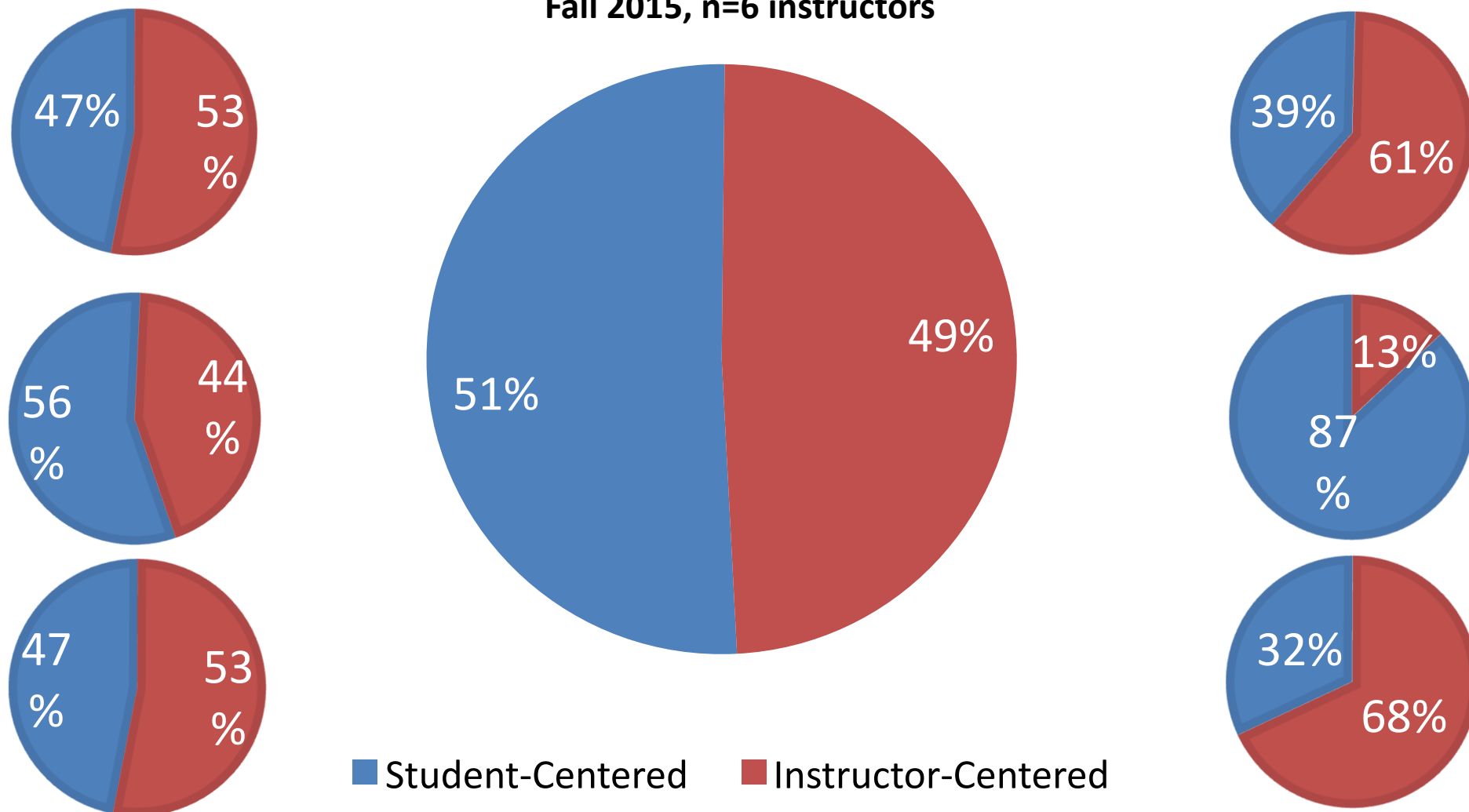
Spring 2015, n=6 instructors



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Although half regularly use student feedback to inform instructional decision-making, the courses remain largely instructor-centered.

Fall 2015, n=6 instructors



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