



# What Instruction Method Enhances Understanding of Fundamental Concepts in an Introductory Meteorology Course?

Montana Etten-Bohm and Don Conlee  
Dept. of Atmospheric Sciences, Texas A&M University

## Motivation

In meteorology, fundamental concepts taught at the introductory level are often misunderstood. Current teaching practices often rely on the traditional technique of lecture-based teaching, but perhaps incorporating different teaching methods could help address this issue. In hopes to improve comprehension, this study assesses four different teaching strategies through review sessions in an introductory meteorology class at Texas A&M University.

## Methods

Review sessions were offered to a section of ATMO 201 (Weather and Climate, for non-majors) in Fall 2019. Four sessions were offered for three topics that have often been misunderstood and assigned randomly to a different teaching method.

### Teaching Methods

1. Game-Based
2. Enhanced Lecture
3. Role-Playing
4. Think-Pair-Share

### Session Topics

1. Force Balances
2. Vertical Structure of Synoptic Systems
3. Stability

Enhanced lecture was most similar to the teaching style of ATMO 201, only differing in the amount of clicker questions. This was done so that the same questions were being asked in each method and no session was superior to another.

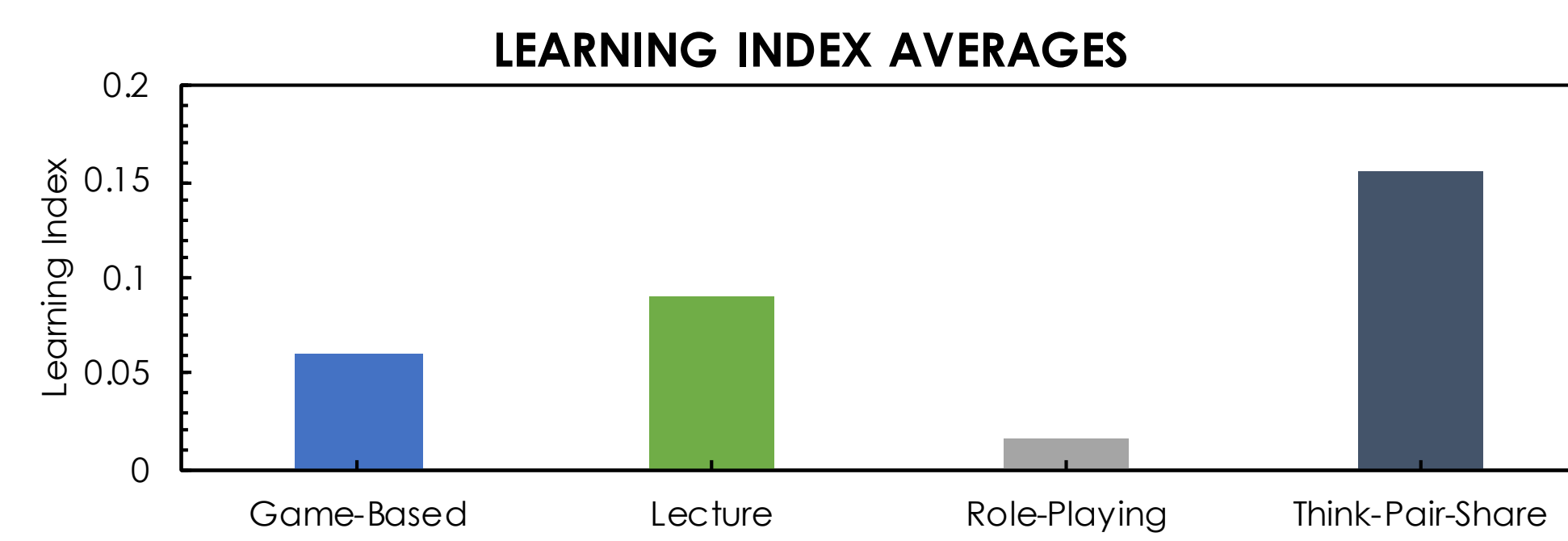
Through the 12 different sessions, 66 students (≈40% of the class) participated in the study.

## Demographics

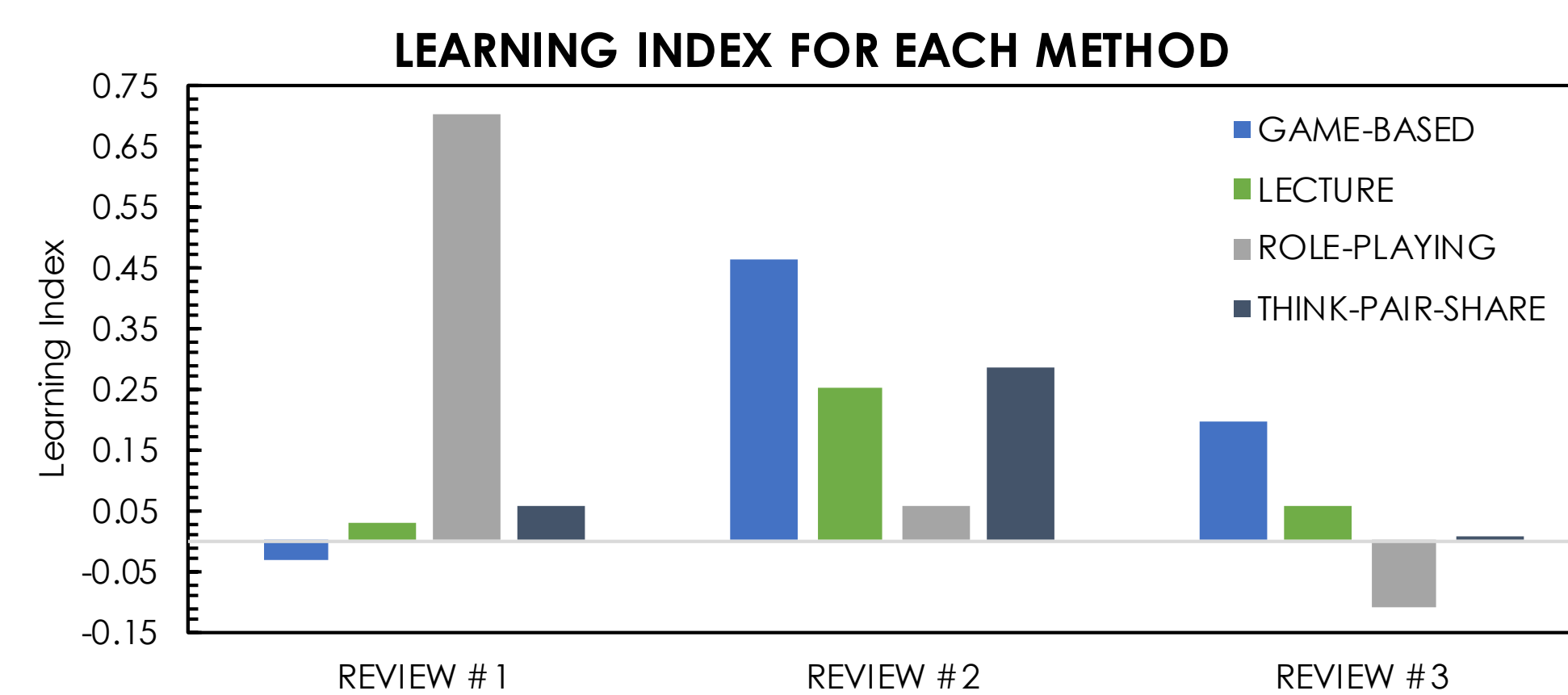
- Class Standing: 49% Freshmen, 39% Sophomores, 7% Juniors and 5% Seniors
- Majors: 13% STEM and 87% Non-STEM
- Gender: 56% Male and 44% Female

## Student Performance

Students were given a pre- and post-quiz at each review session to gauge how much they learned, from which the learning index was calculated.



- Overall, students performed best with think-pair-share and worst with role-playing.

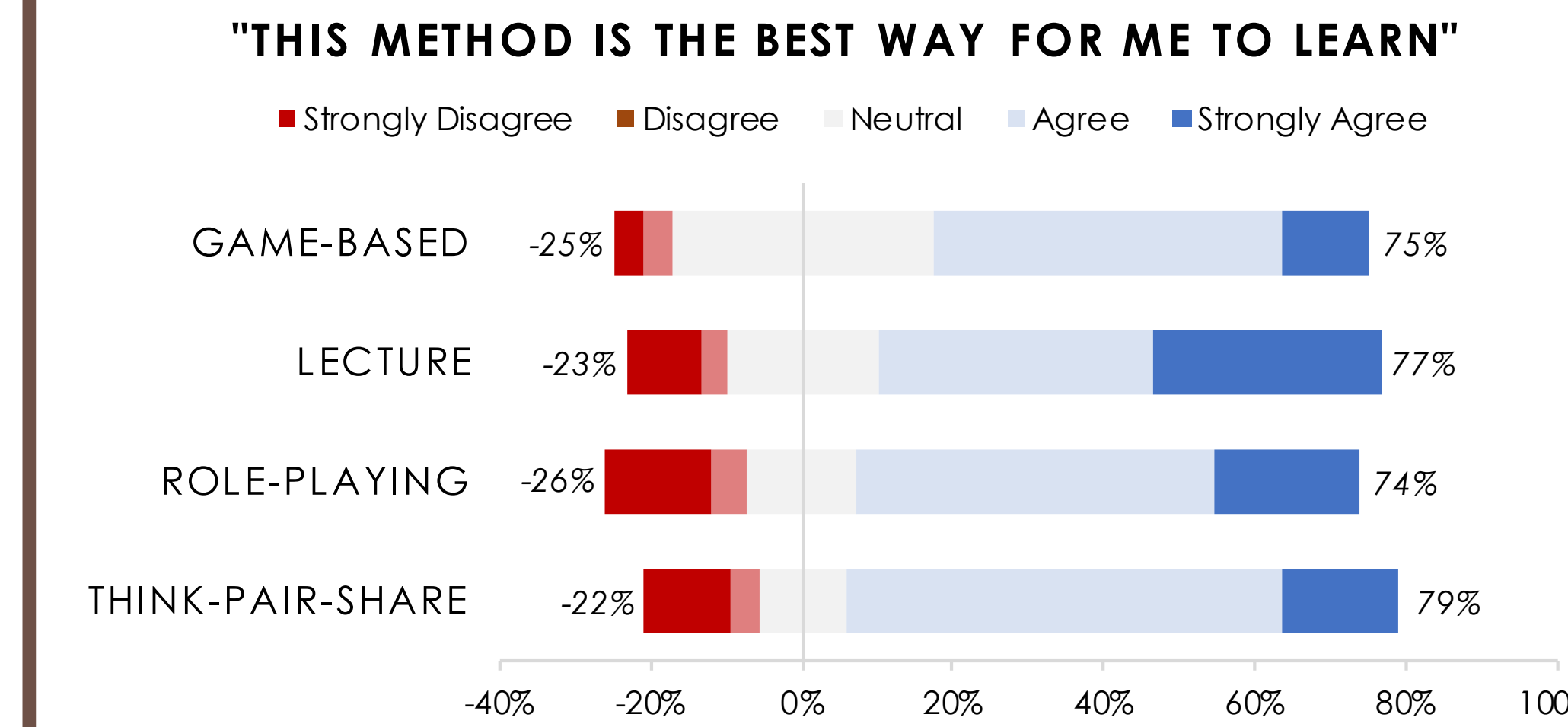


- Students performed best with role-playing for force balances, while students performed worst with role-playing for stability.
- For game-based, students scored best for vertical structure, but worst for force balances.
- Lecture and think-pair-share scored relatively low for force balances and stability, and mediocre for vertical structure.

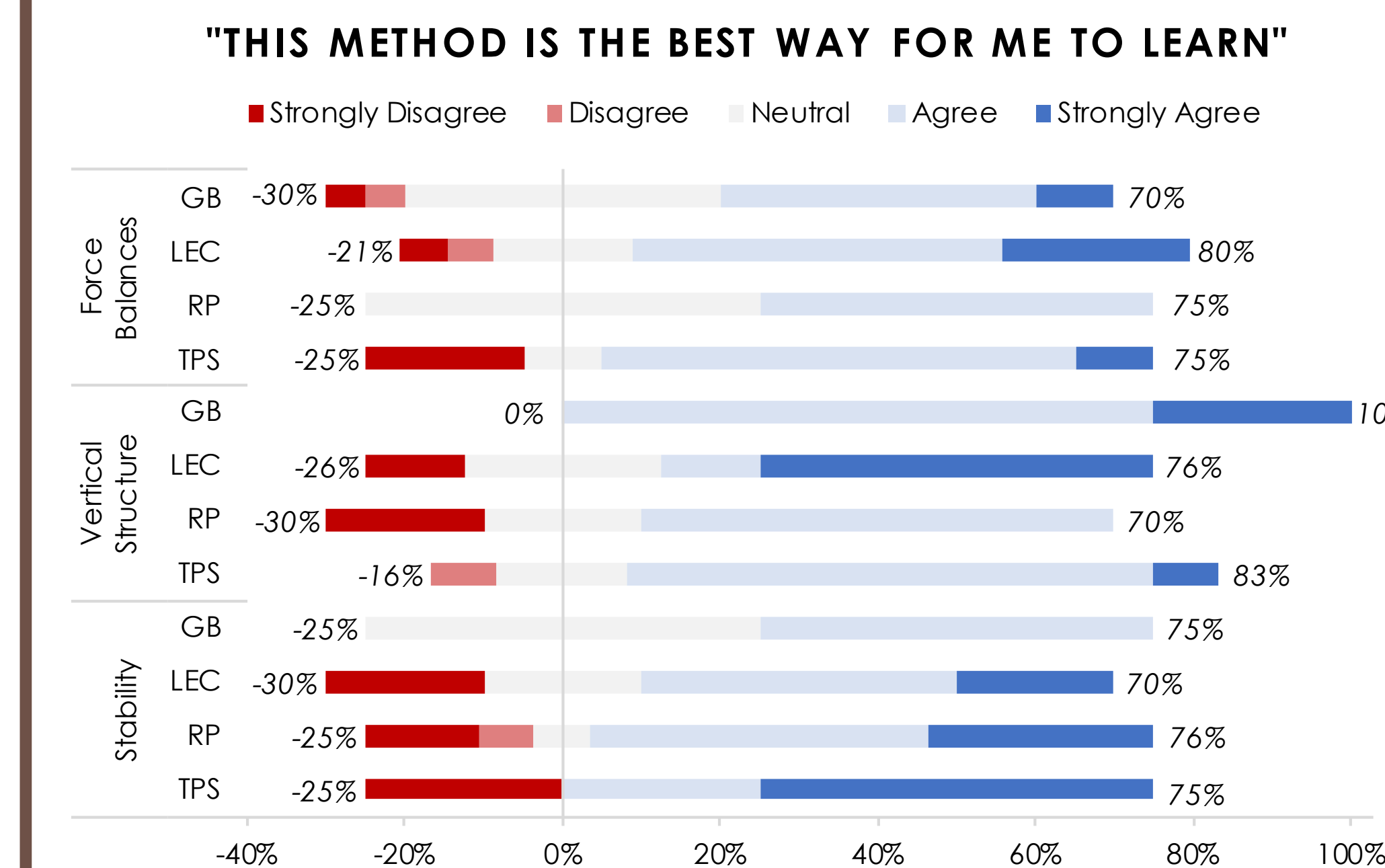
We wanted to note here that these results could be misleading and may not be the most accurate way to assess the methods. Many students mentioned in their reviews that they weren't auditory learners, and usually needed to sit down with the material outside of class to really grasp it, and therefore wouldn't improve from pre- to post-quiz, regardless of method. However, other students significantly improved from pre- to post-quiz which still makes this a viable assessment technique.

## Student Assessment

Students were asked to rate how the method suited them from "Strongly Disagree" to "Strongly Agree."

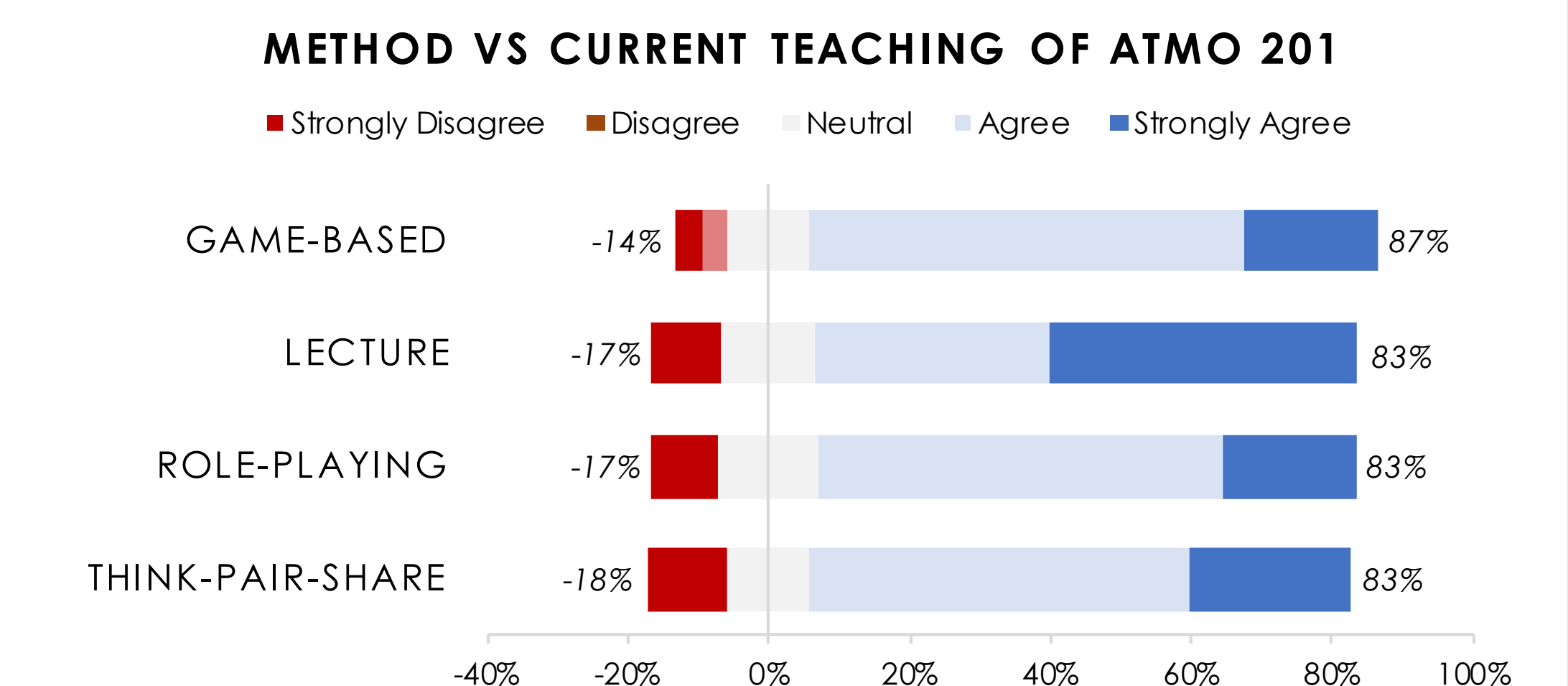


- Overall, think-pair-share was the best scoring method, while role-playing was the worst.



- Game-based the best rated for vertical structure, but worst for force balances, while lecture was rated highest for force balances and lowest for stability.
- Role-playing and think-pair-share's ratings didn't vary much between topics.

Students were then asked to compare to the current teaching methodology used in ATMO 201.



- Overall, students expressed that all methods improved upon the current methodology in ATMO 201.
- Game-based had slightly more positive feedback, although lecture received the most amount of "Strongly Agrees."

Students were also asked about what they most liked in the session and what needed to improve.

	Top Answers	
	Most Liked	To Improve
Overall	Interactiveness	More Examples
Game-Based	Explanations	More Examples
Lecture	Checked Understanding	More Examples
Role-Playing	Involvement	More Participants
Think-Pair-Share	Examples	More Practice

- The most disliked attribute through all the sessions, regardless of topic, was how fast material was presented in the sessions.

## Conclusion

- Overall, students felt that the methods used in the reviews improved upon the current teaching style of ATMO 201.
- The best method varied based on topic, and therefore a mixture of these methods would be recommended for incorporation into ATMO 201.

## Future Work

The study will be repeated in the Spring of 2020 to increase the total number of participants in the study.

## Acknowledgements

This study is funded through the Center for the Integration of Research, Teaching and Learning Teaching-As-Research program at Texas A&M.