A Study of Evidence-Based Practices in a U.S. University: Lessons for Faculty Development

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Otterbein University

Private, primarily undergraduate, teaching focused institution

Location: Westerville, OH, USA

- 3,000 students
- Student-faculty ratio 11:1
- 1 of every 10 students is a STEM major

RESEARCH QUESTIONS

OVERARCHING QUESTION

What teaching, learning and co-curricular evidence-based practices (EBPs) are used among STEM majors and faculty, and how do they contribute to student learning and retention?

SPECIFIC QUESTIONS

What is faculty members' knowledge of EBPs, and how often and where do faculty members use such practices in first and second year foundation modules (courses)?

How do faculty members learn about these practices, and what factors influence their choice of practices?

Methods

FACULTY SURVEY

Addressed (1) perceived importance and achievement of instructional goals; (2) awareness and use of EBPs; (3) factors that influence awareness and adoption of EBPs.

Sent to 33 faculty teaching STEM foundational courses (75% responded)

FACULTY FOCUS GROUP

Addressed differences between disciplines; conducted following survey with 5 faculty members

FACULTY INTERVIEWS

Addressed class design and experiences; conducted with 13 faculty members

CLASSROOM OBSERVATIONS

Used Classroom Observation Protocol for Undergraduate STEM (COPUS)

Observed 60 class periods from 12 different instructors completing surveys and interviews

Smith, M. K., Jones, F. H. M., Gilbert, S. L., Wieman, C. E. (2013). The Classroom Observation Protocol for Undergraduate STEM (COPUS): A new instrument to characterize university STEM classroom practices. *CBE Life Science Education 12*(4), 618-627.

Rogers' Diffusion of Innovation Theory

Five stages for adopting an innovation:

1. Knowledge: become aware of the innovation and how it functions
2. Persuasion: form an attitude toward the innovation
3. Decision: choose to adopt or reject the innovation
4. Implementation: put the innovation to use
5. Confirmation: seek reinforcement of the decision to use the innovation

Prerequisite: need or a problem that drives the change.

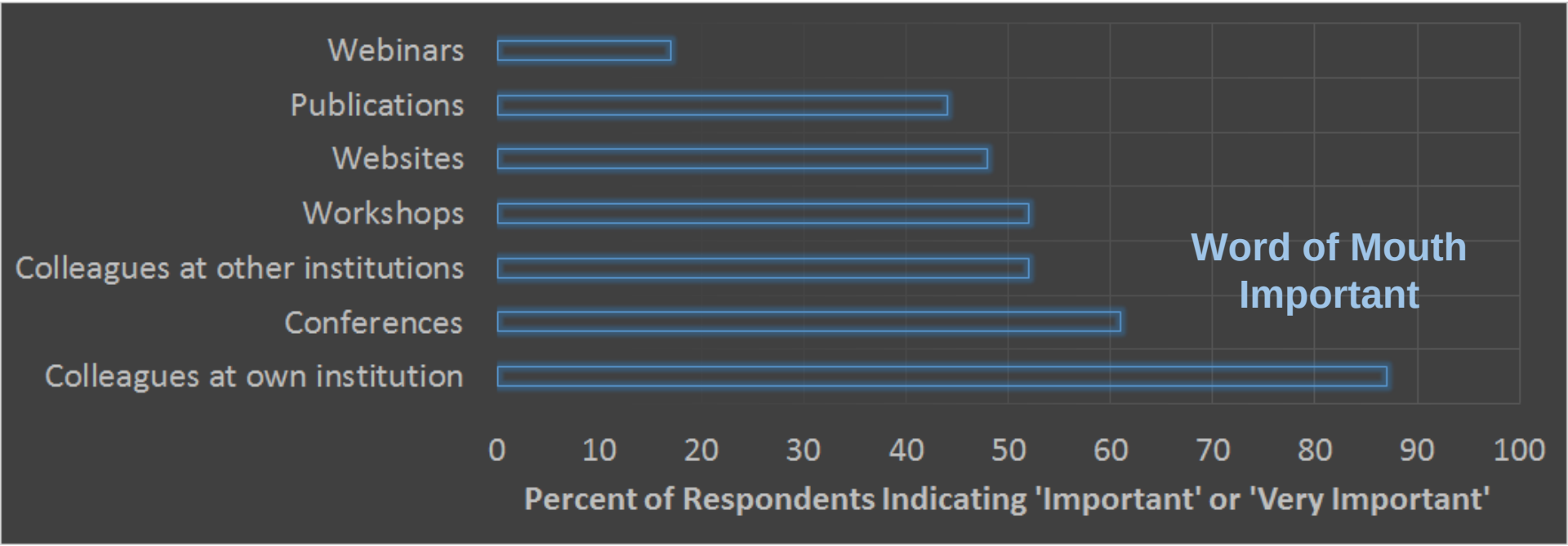
Rogers, E. M. (2003). *Diffusion of innovations*. New York NY: The Free Press.

Need for Innovation

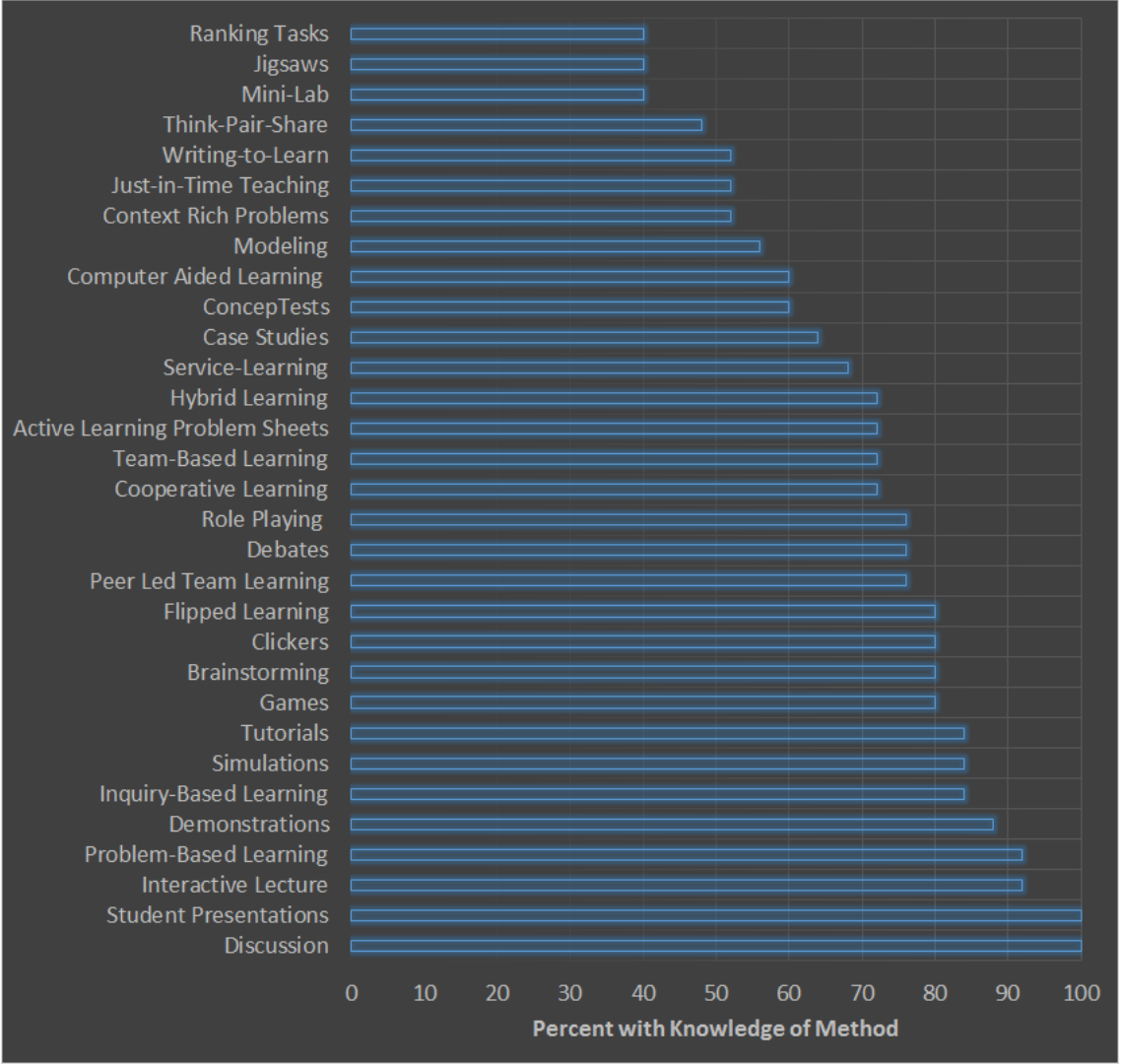
Faculty not satisfied that important goals are being met

Goal	Satisfied/Very Satisfied
Problem Solving	63%
Conceptual Understanding	38%
Student Appreciation of the Discipline	29%

Knowledge - What Do Faculty Consider the Most Important Methods to Find Out about EBPs?



Knowledge of EBPs



Faculty members know of 71% of evidence-based practices on average.

Persuasion and Decision

Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters.

Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use.

Rogers, E. M. (2003). *Diffusion of innovations*. New York NY: The Free Press.

Persuasion and Decision

Category	*Factor*	*Percent Responding as 'Important' or 'Very Important'*
Compatibility	Time it takes in class	96
	Evidence of its impact on student learning	92
	Class size	79
	Student resistance	54
Complexity	Access to ready-to-use materials	87
	Ability to easily incorporate	79
	Time to prepare	79
	Resources (funding, technology)	67
Culture	Value of student-active pedagogy within department	46
	Effect on teaching evaluations	42
	Peer support	33
	Value of student-active pedagogy within university	27
	Importance in tenure & promotion decisions	17

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Women identified complexity and cultural factors as being more important than men.

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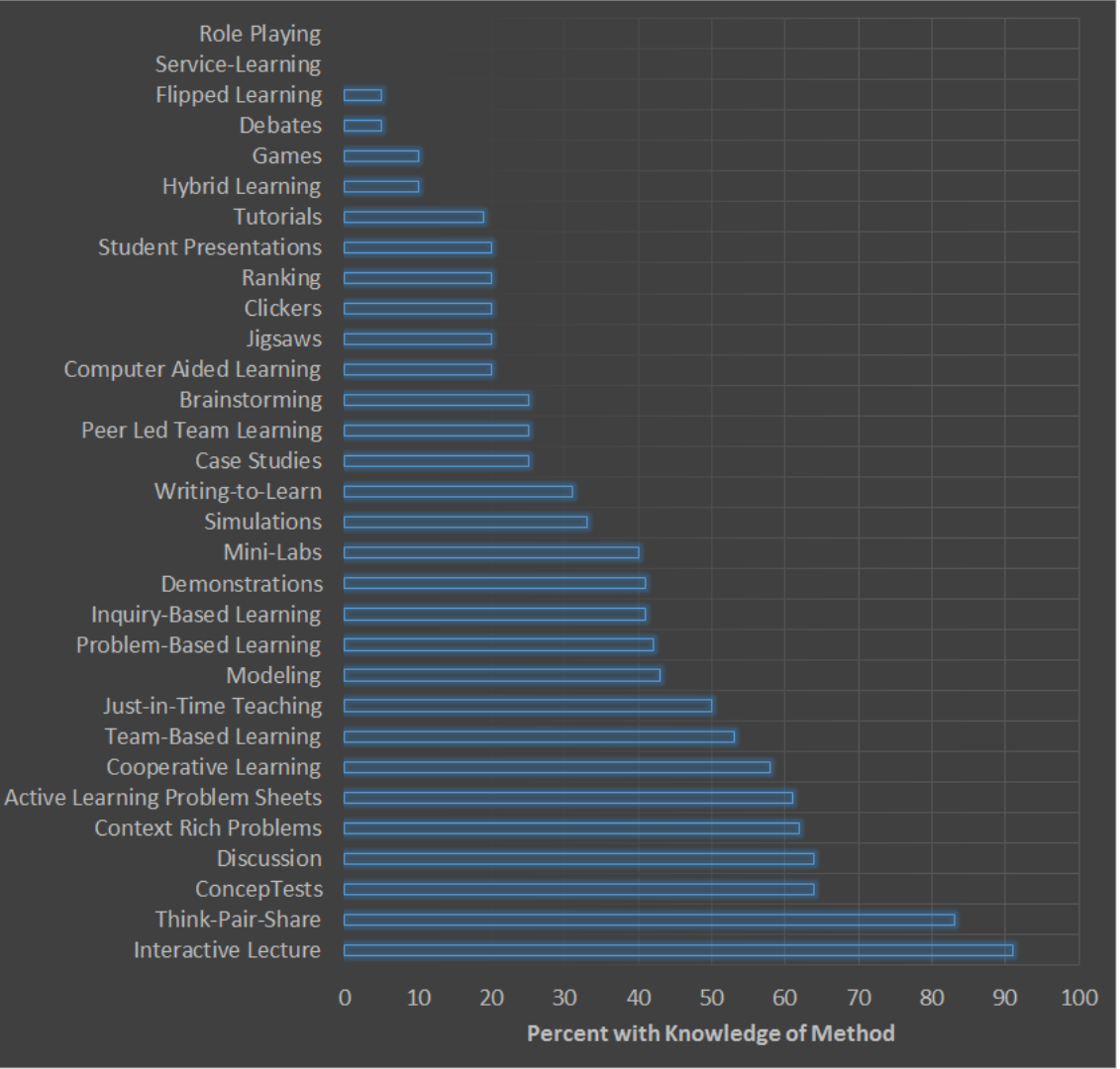
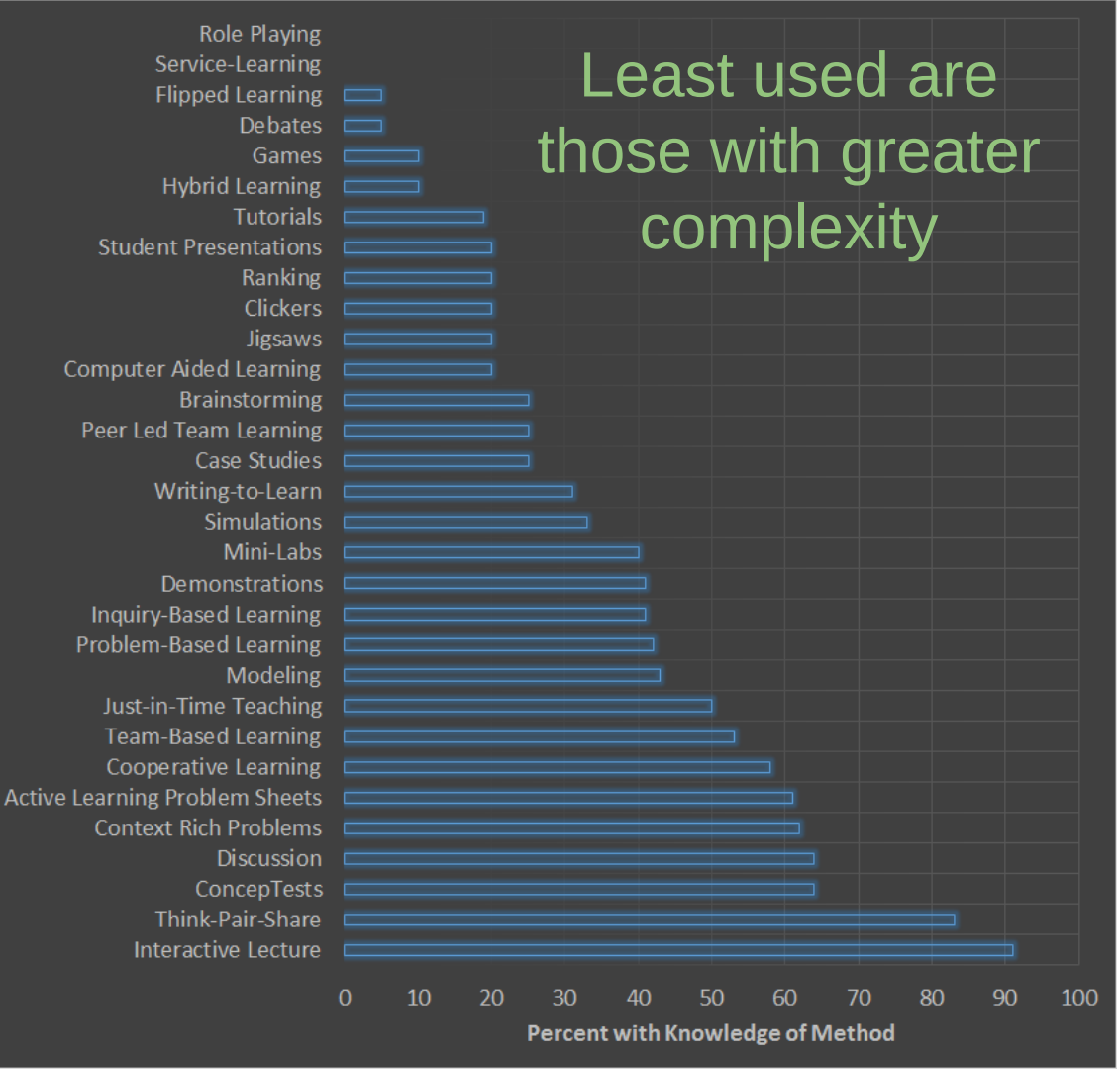
Newer faculty (<10 years) rate cultural factors as more important than experienced faculty



Implementation: Survey Results

Seven evidence-based practices used per module on average



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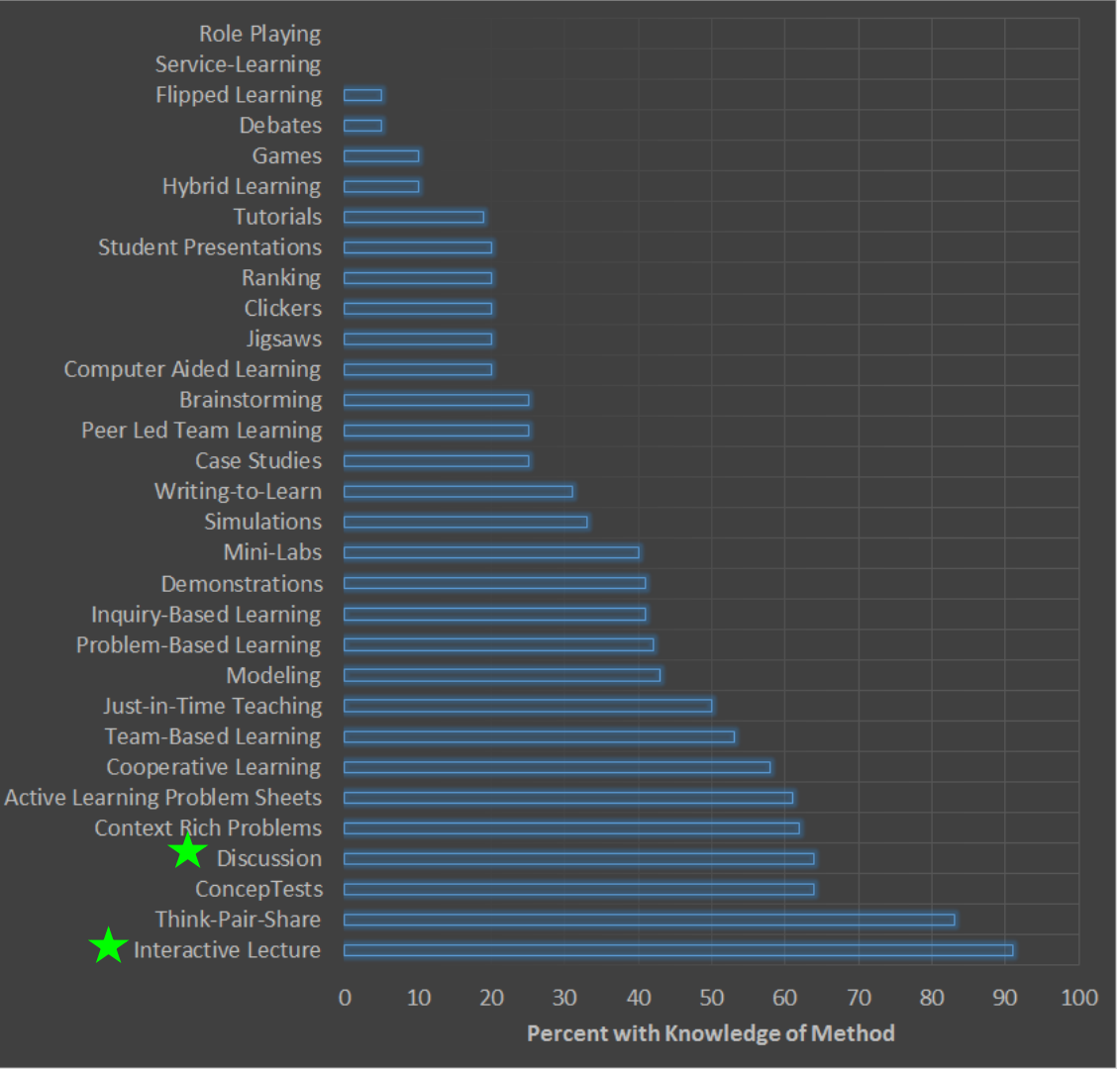


Gender differences

Women report more use of:

- interactive lecture (91% vs. 79%)
- discussion (73% vs. 57%)

Implementation: Classroom Observations

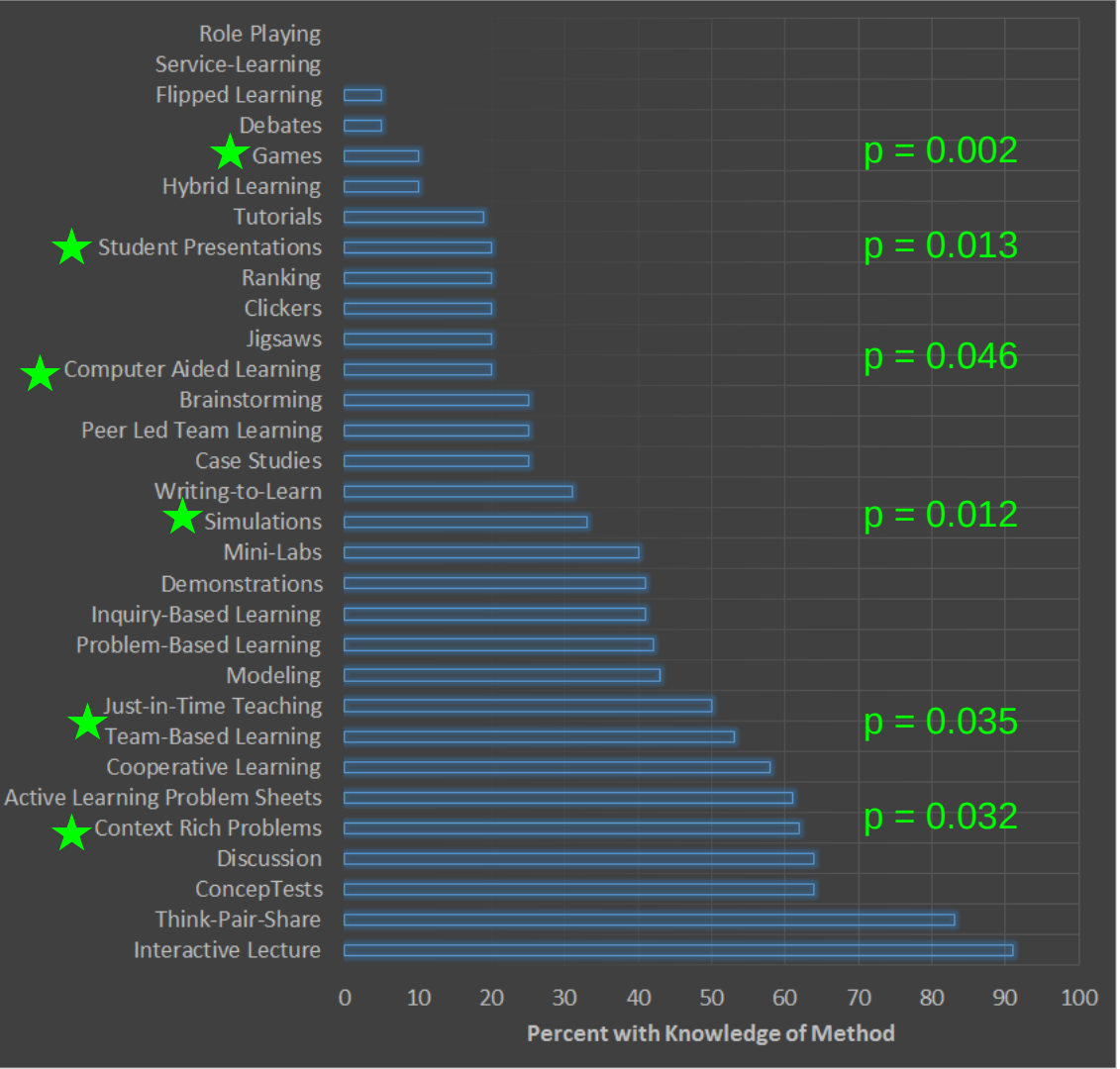
Gender Differences

Female faculty:

- Have students work in groups more (p = 0.037, 15% vs. 7% for males)
- Move through groups more (p = 0.005, 18% of two-minute intervals vs. 9% for males)

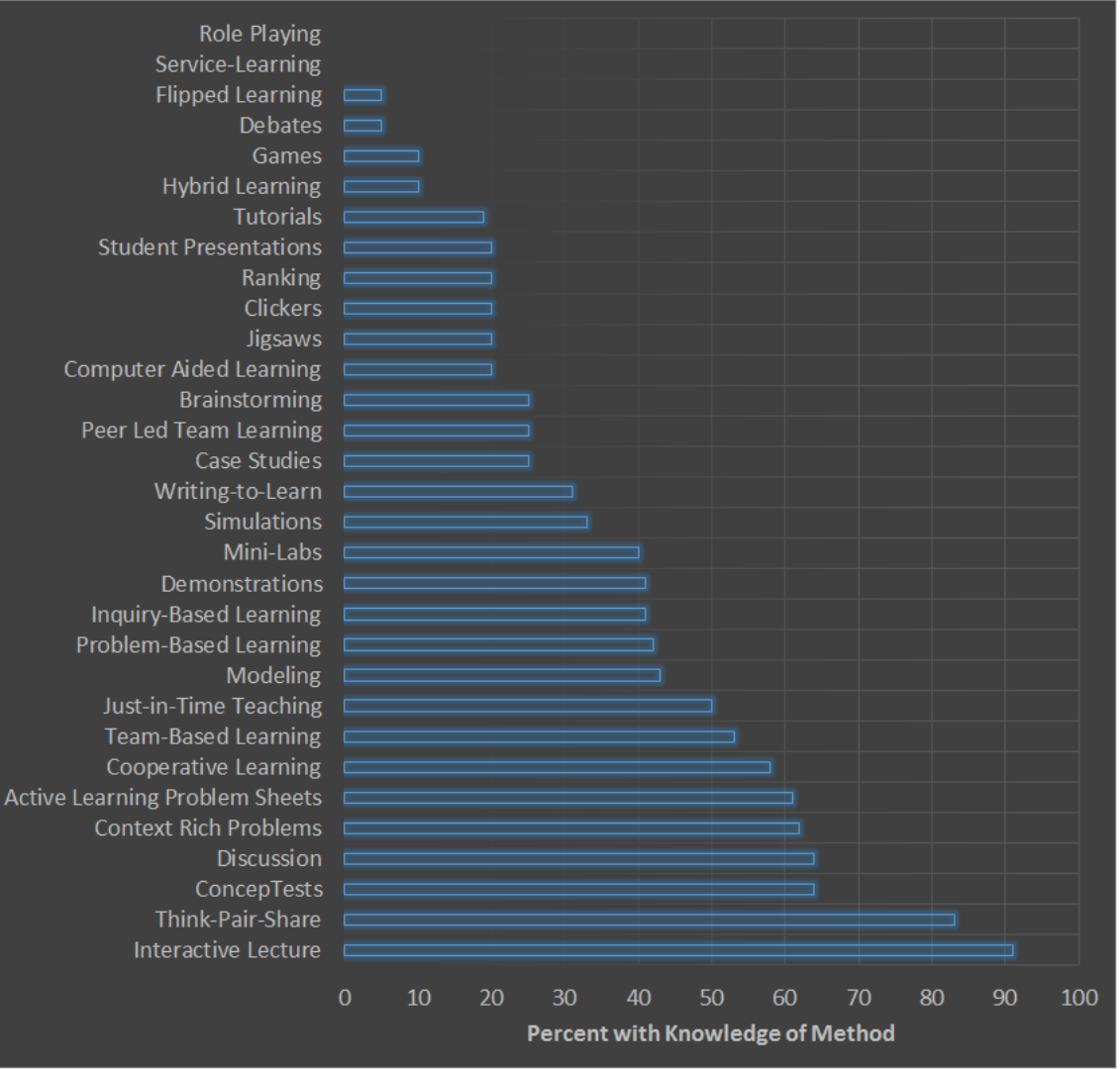
Male faculty:

- Have students listen more (p = 0.006, 85% vs. 74%)
- Listening associated with passive student behavior



Differences by discipline

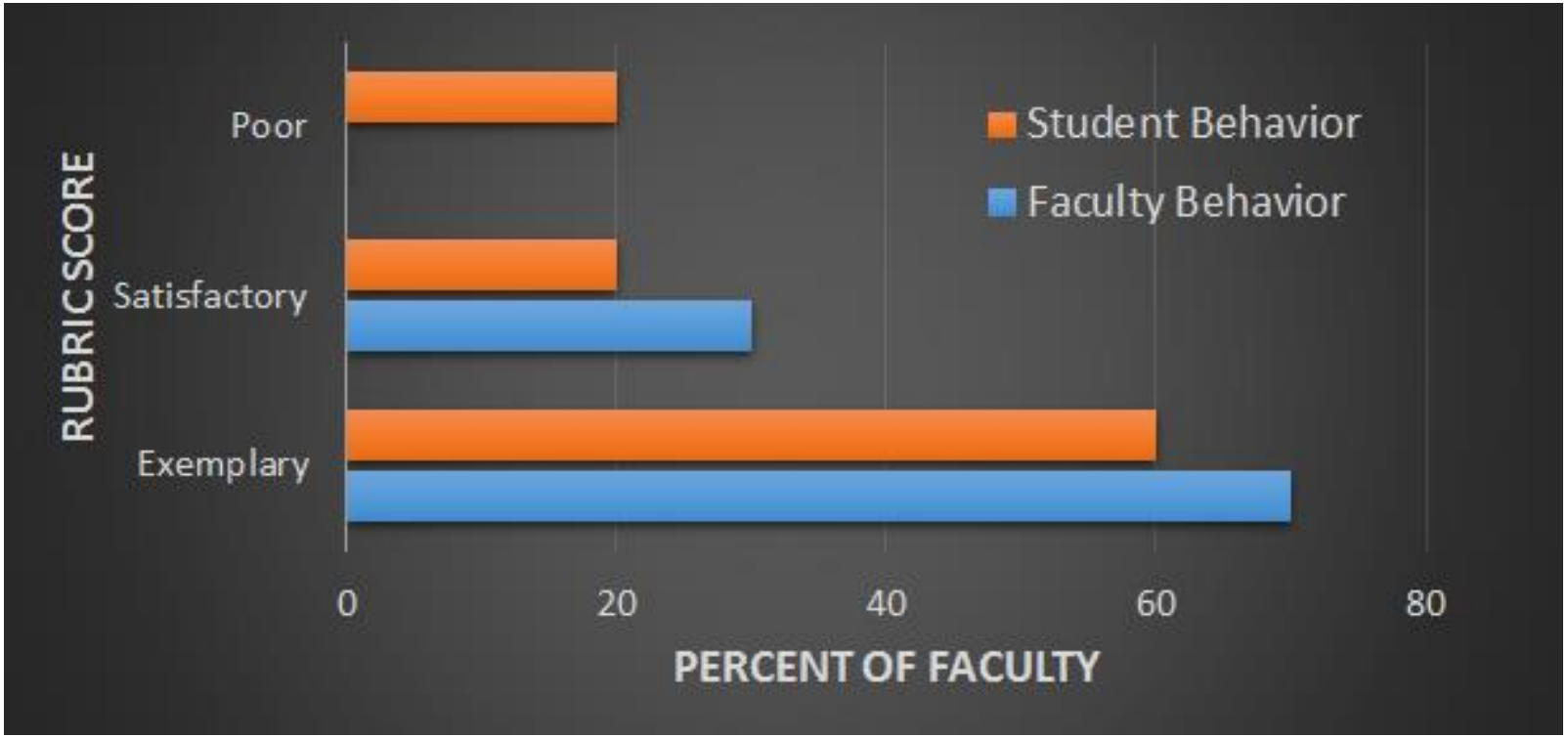
- Games
- Student presentations
- Computer Aided Learning
- Simulations
- Team-Based Learning
- Context Rich Problems



Differences by faculty rank & experience

- 38% of EBPs used solely by tenure-track faculty
- Part-time faculty have decreased use of EBPs that rely on technology

Implementation - Agreement between Faculty Interviews and Observations



Faculty have more difficulty describing student behaviors.

Confirmation: Limited Alignment of Goals with Use of EBPs

Of faculty indicating **problem-solving** is a ‘very important’ goal...

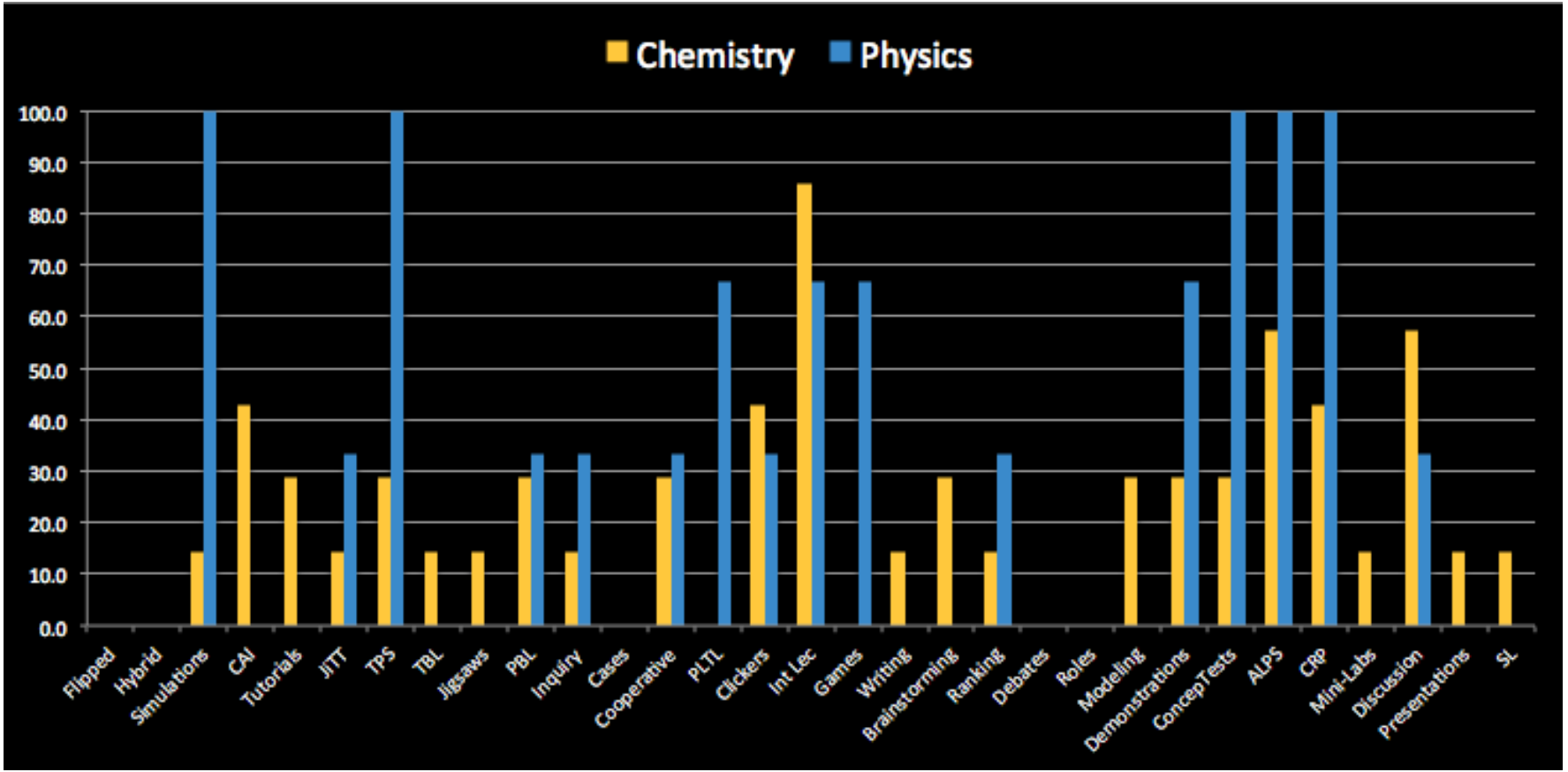
Percent who had not heard of…

- Problem-based learning - 13%
- Context-rich problems - 40%
- Active-learning problem sheets - 33%
- Modeling - 16%

Percent with relative use of...

- Problem-based learning - 38%
- Context-rich problems - 80%
- Active-learning problem sheets - 80%
- Modeling - 67%

Confirmation: Agreement Among Colleagues



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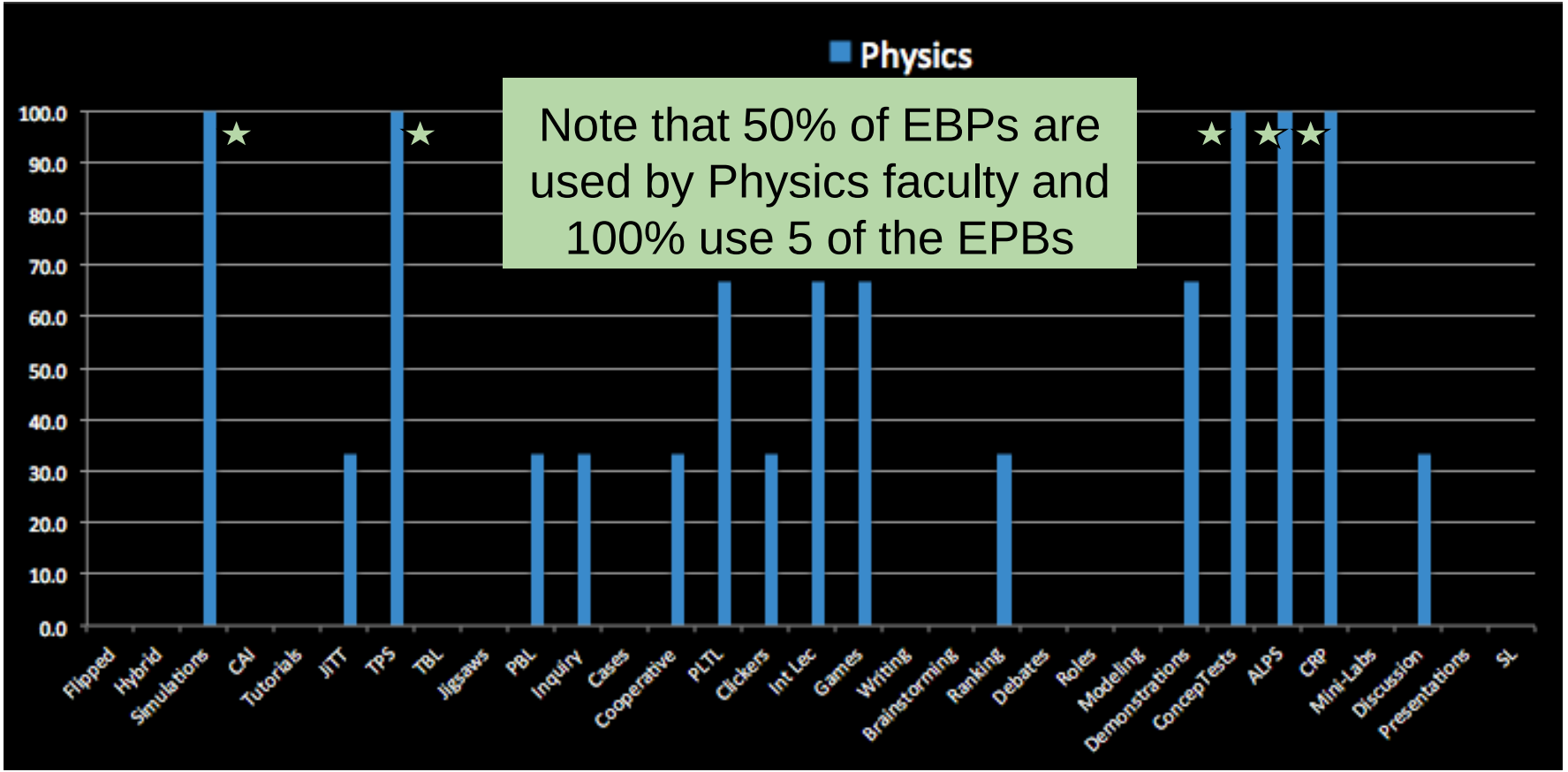

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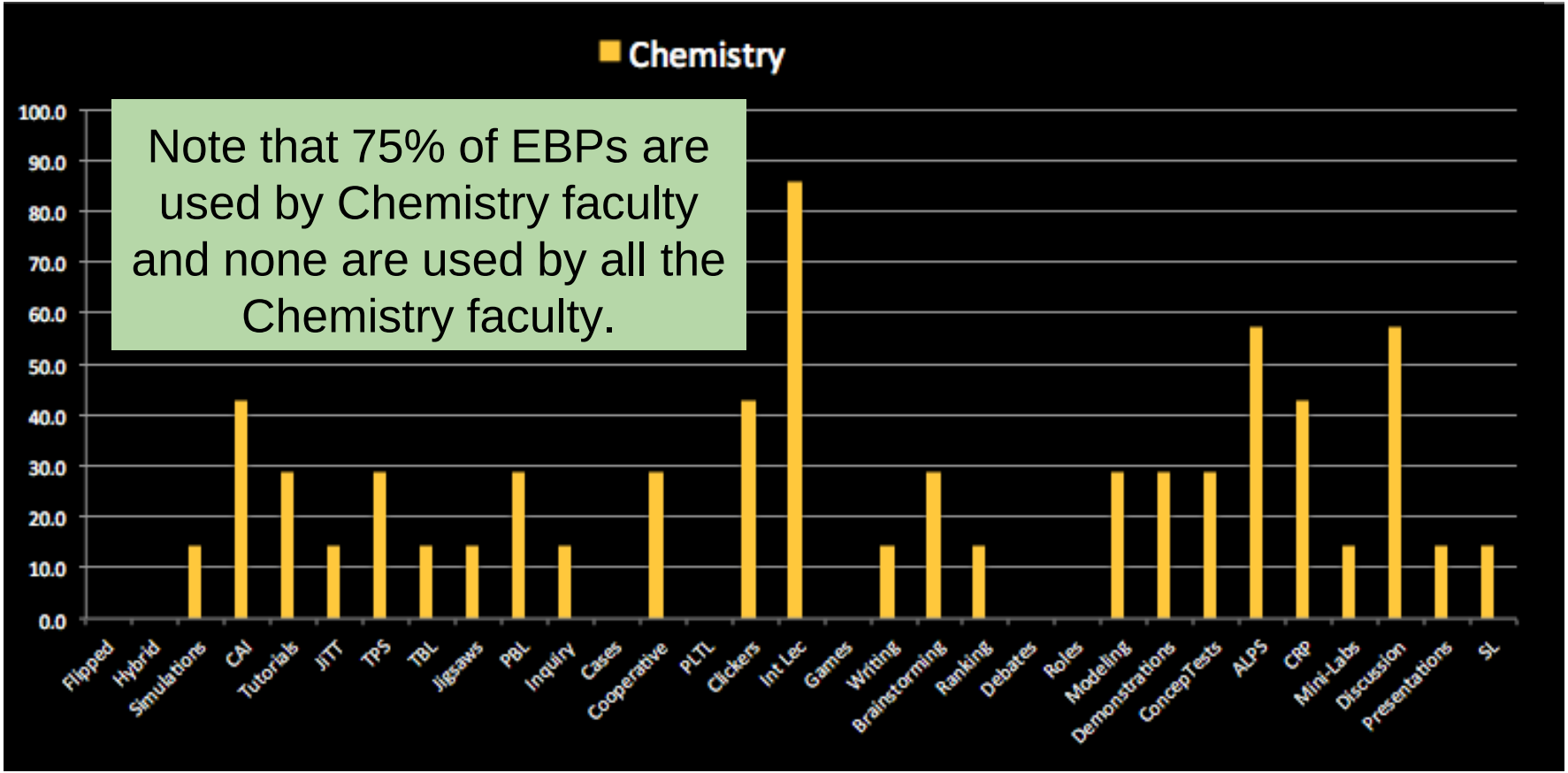
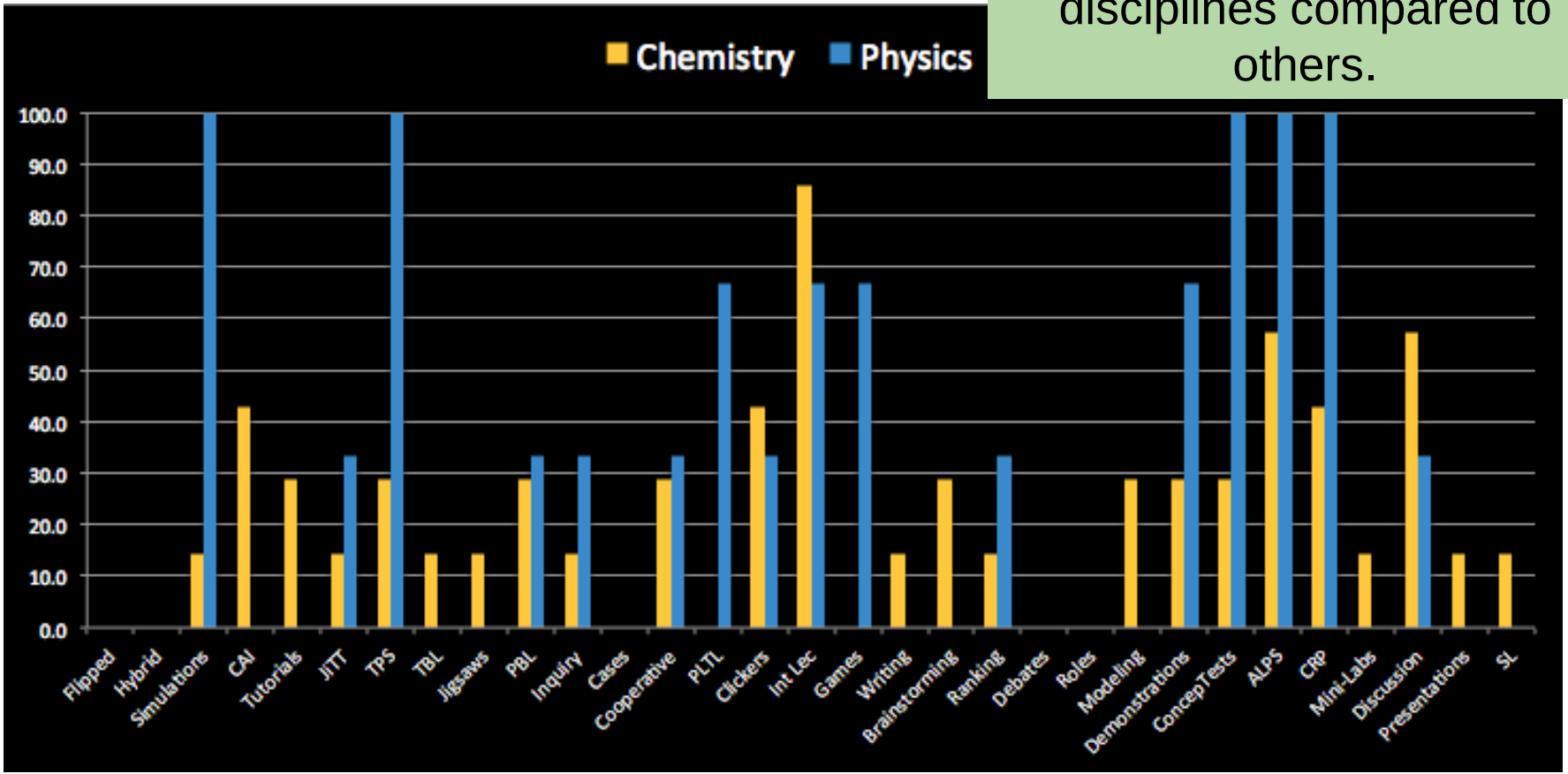


Confirmation

Greater consistency and confirmation in some disciplines compared to others.



Recommendations for Faculty Development

1. **Pre-requisite**: Identify a need for change by reflecting on satisfaction that goals are being met in the classroom.
2. **Knowledge:** Use interpersonal methods of educating faculty about EBPs.
3. **Persuasion:** Consider the compatibility of the method with the course, and scaffold to reach the instructors' desired level of complexity.
4. **Persuasion:** Target select audiences to consider their specific cultural concerns.
5. **Implementation:** Conduct observations to identify and confirm faculty and student behaviors.
6. **Implementation:** Having faculty consider courses from students' perspectives may be a segue for faculty development.
7. **Confirmation:** Reflect on agreement between choices of EBPs used and instructional goals.
8. **Confirmation**: Reinforce decisions through discussion with colleagues.

Faculty Survey

Please go to the following URL to take our survey.

https://www.surveymonkey.com/r/widersurvey

Research question: are responses different for an international audience of faculty versus US faculty?

Confirmation: Limited Alignment of Goals with Use of EBPs

Of faculty indicating **improvement of student attitudes** is a ‘very important’ goal...

Percent who had not heard of..

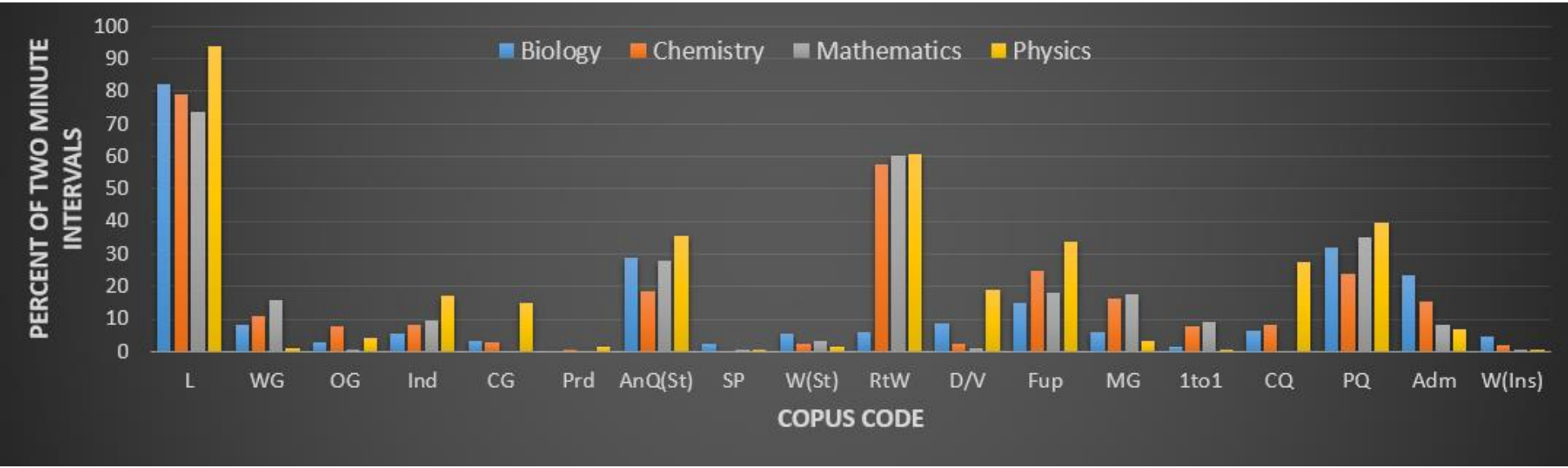
- Team-based learning - 12%
- Cooperative Learning - 25%
- Peer-Led Team Learning - 25%
- Think-pair-share - 50%
- Jigsaws - 62%

Percent with relative use of...

- Team-based learning - 17%
- Cooperative Learning - 33%
- Peer-Led Team Learning - 17%
- Think-pair-share - 75%
- Jigsaws - 33%

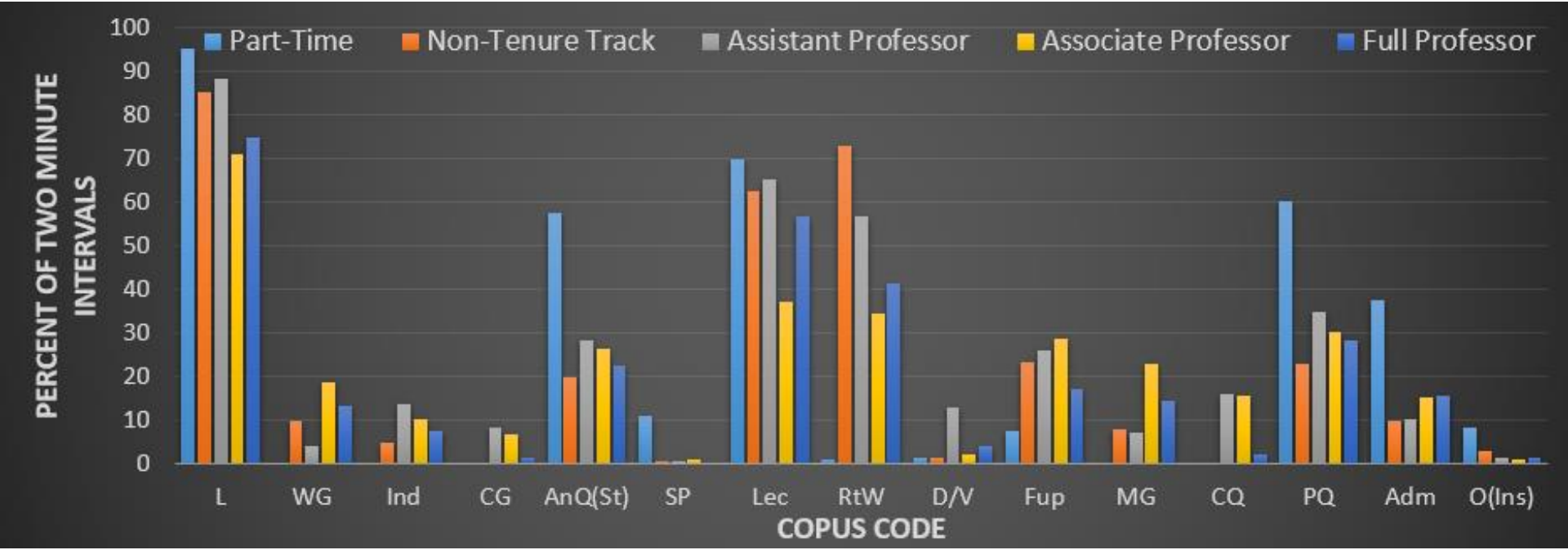
Implementation: Classroom Observations

Differences by Discipline



Implementation: Classroom Observations

Differences by Faculty Rank



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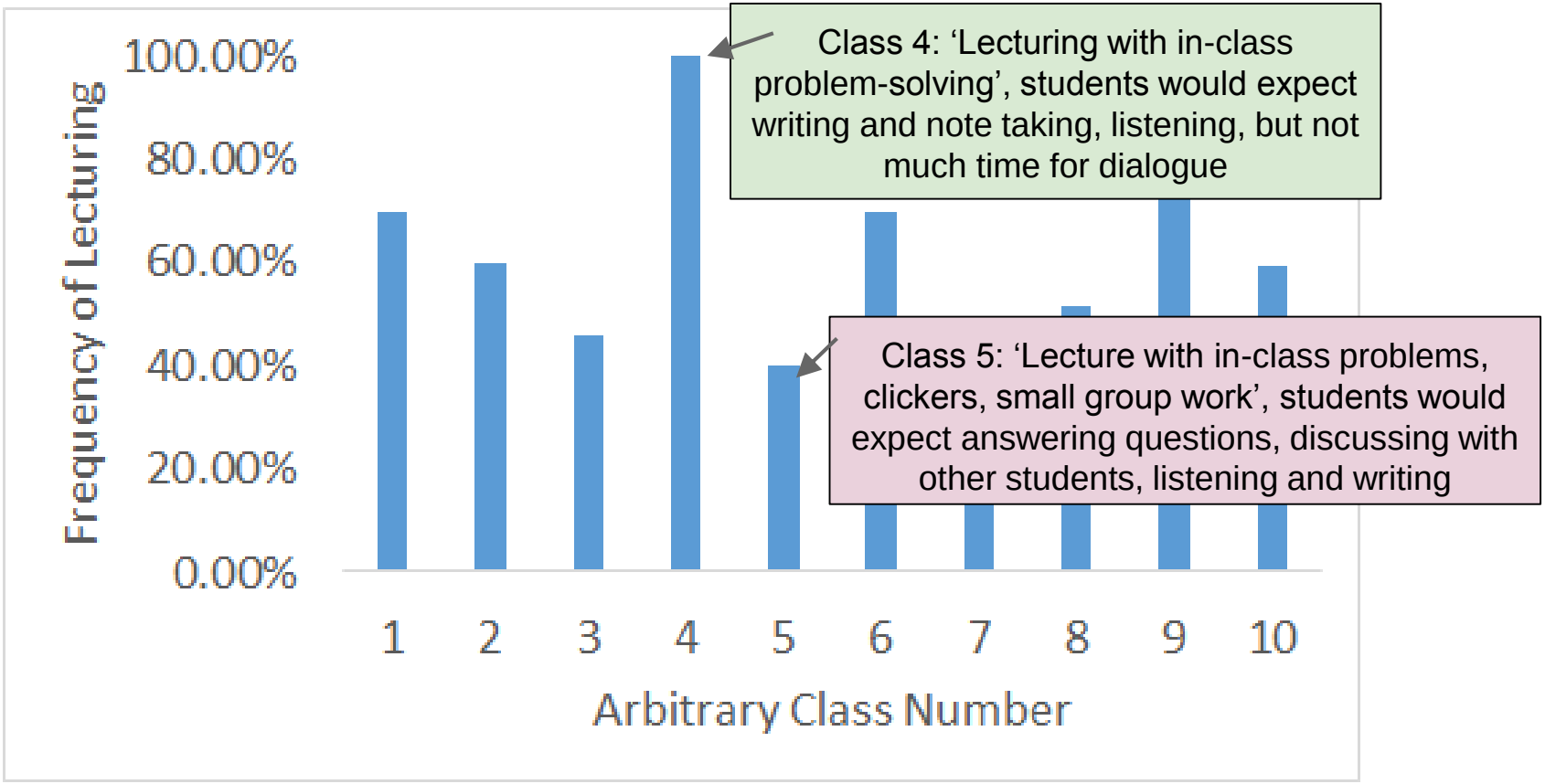
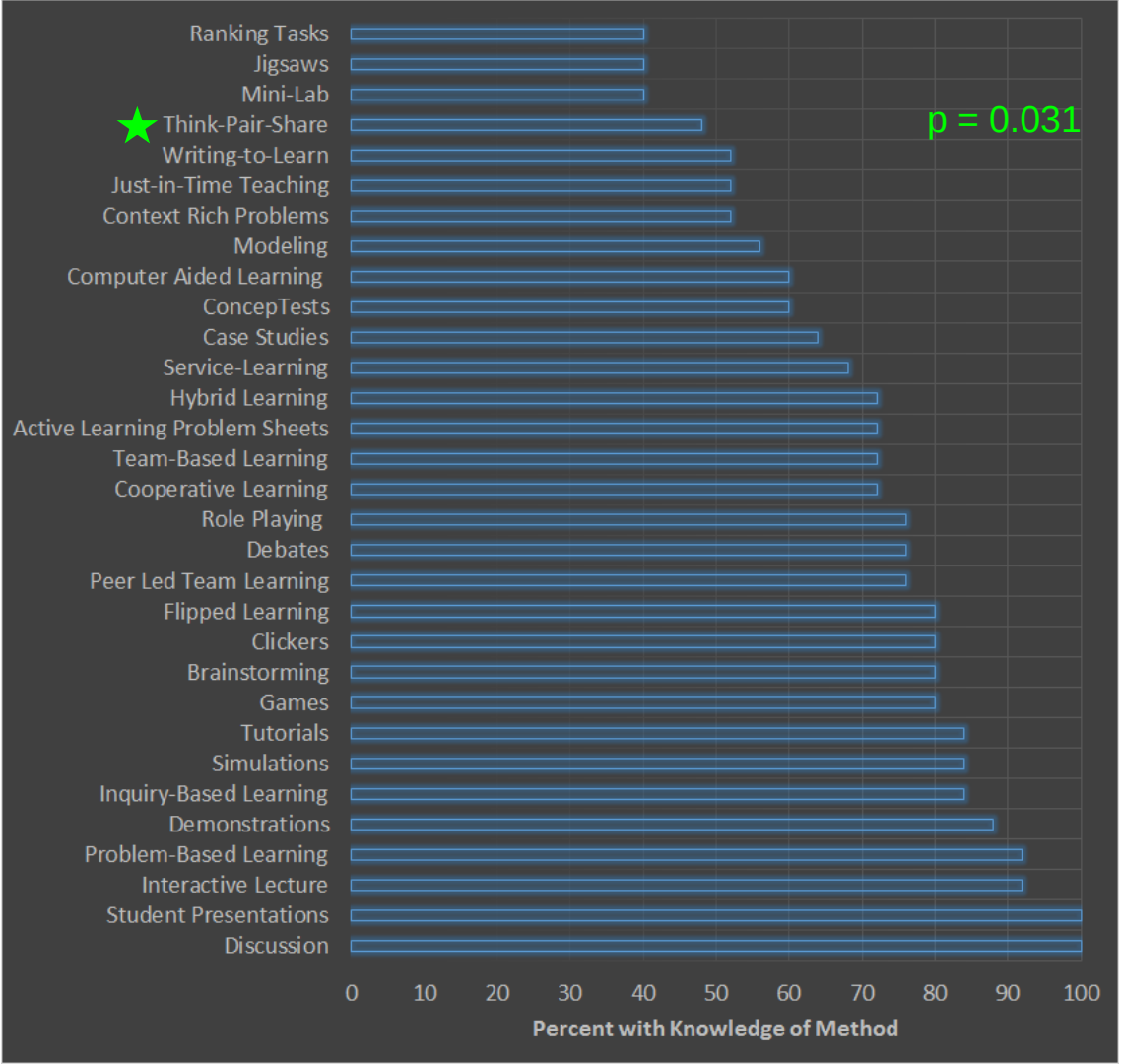
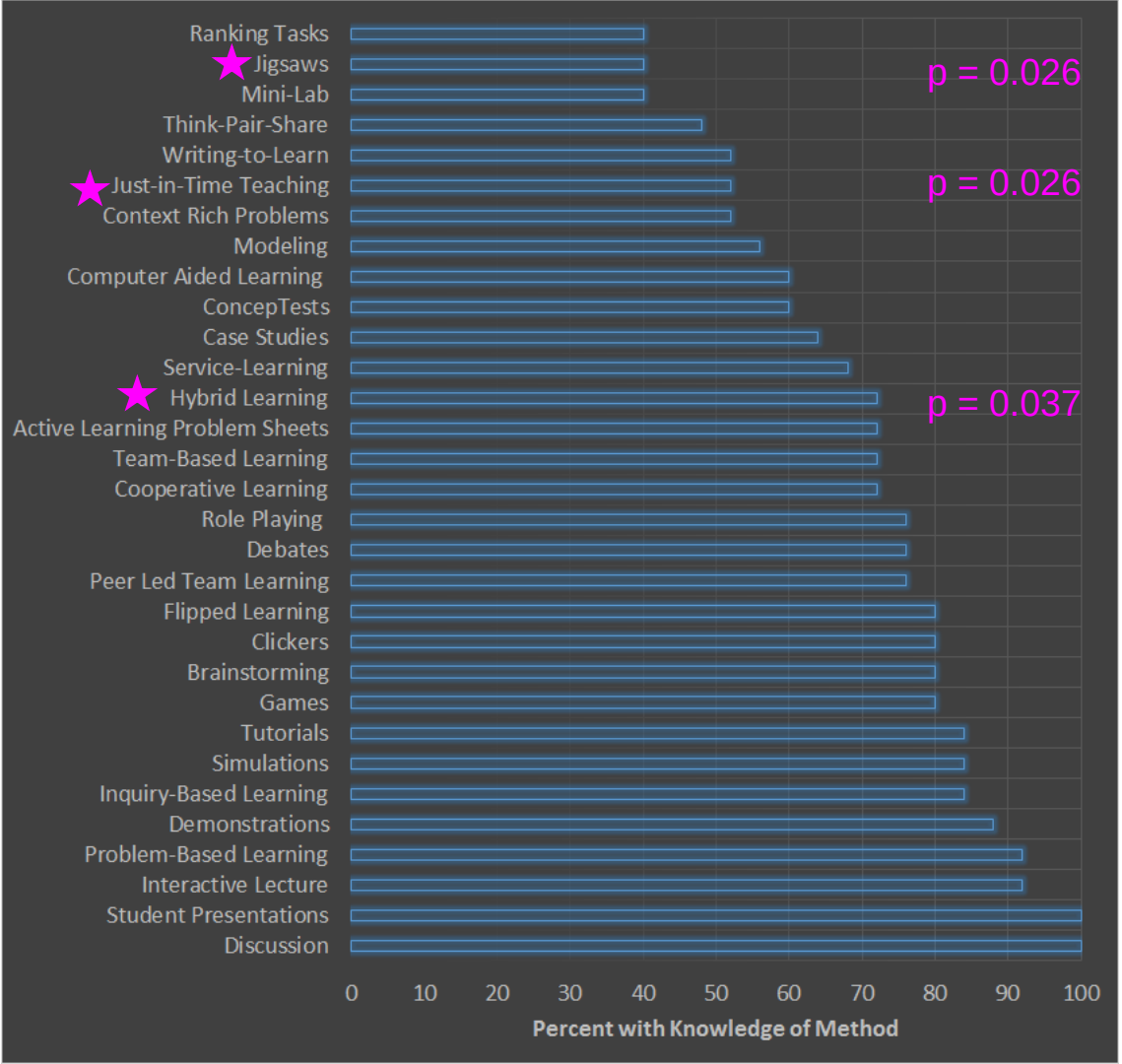




Knowledge of EBPs

★Differences by discipline:

100% of physicists aware of think-pair-share but only 11% of mathematicians.



Knowledge of EBPs

★Differences by faculty rank:

- Hybrid learning
- Just-in-Time (JiTT)
- Jigsaws