Curricular Reform as Institutional Transformation: Infusing Active Learning into Introductory Life Science Courses

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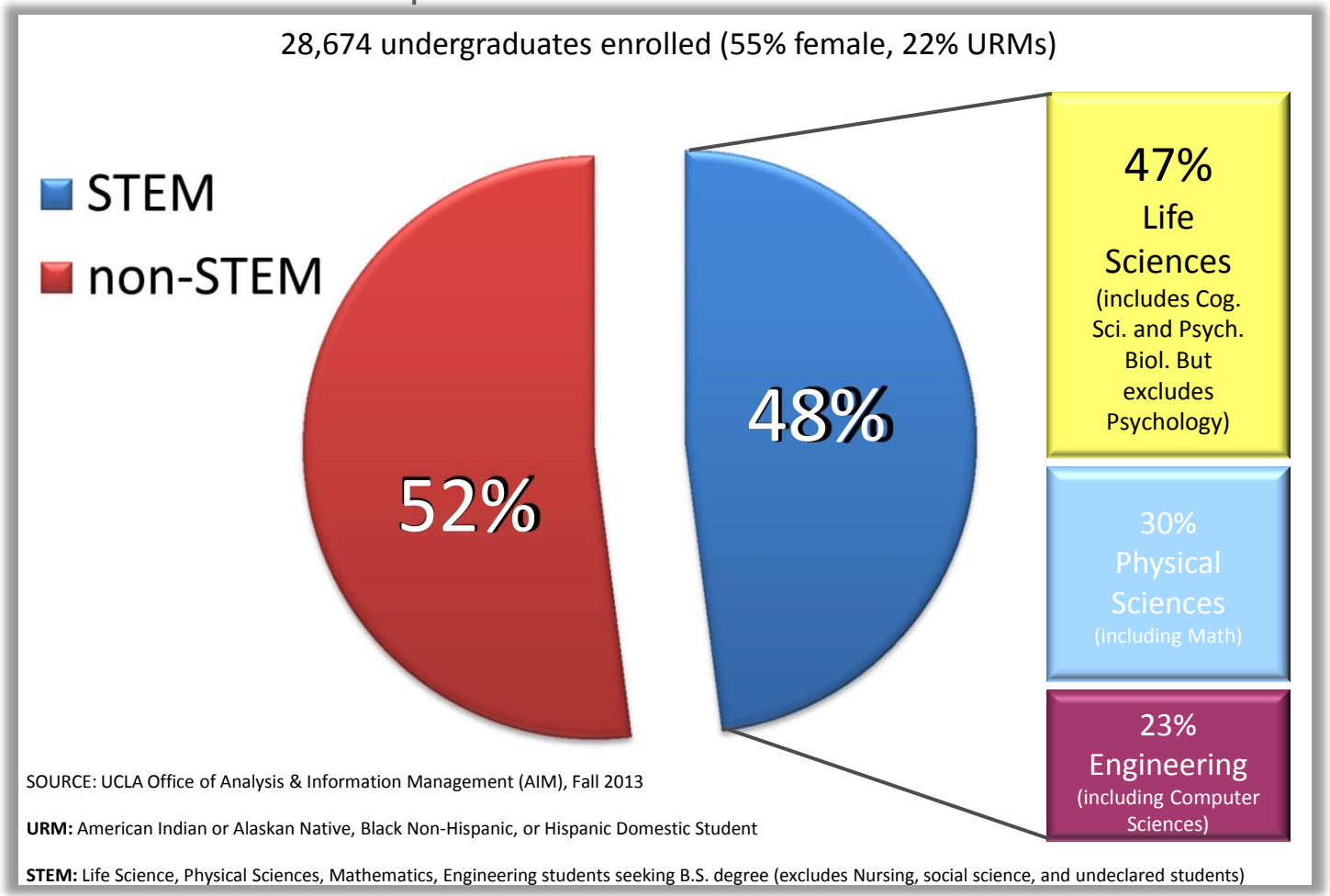
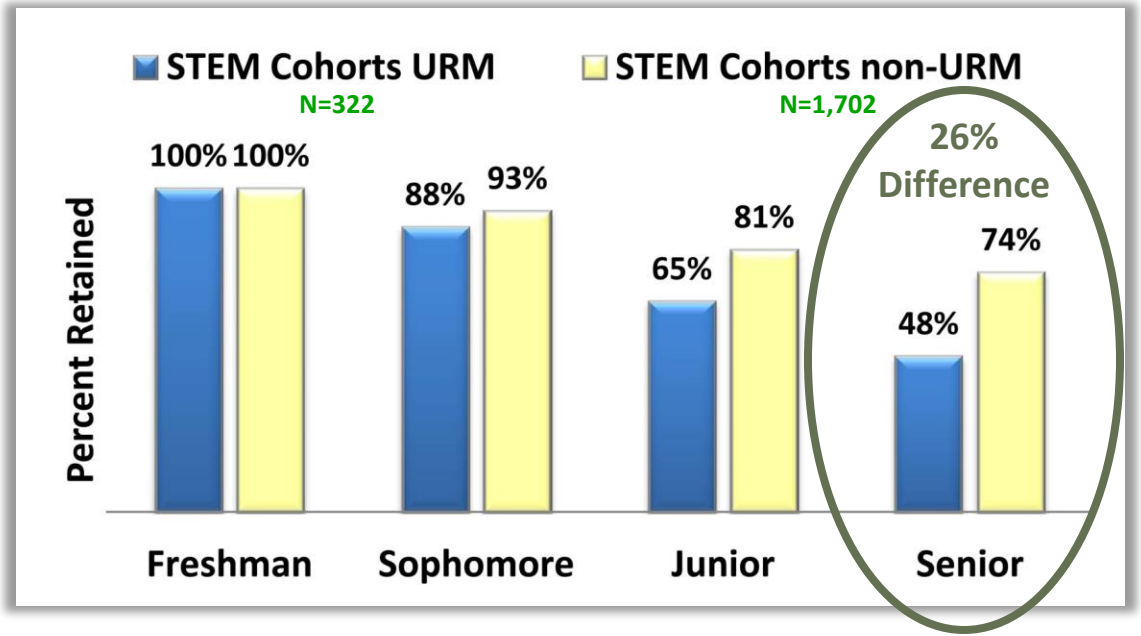
Purpose

- Examine the extent to which active-learning is associated with learning in introductory Science, Technology, Engineering, and Mathematics (STEM) courses.
- Examine whether active-learning strategies disproportionately benefit learning among underrepresented racial minority (URM) students.

Landscape of STEM Education at UCLA

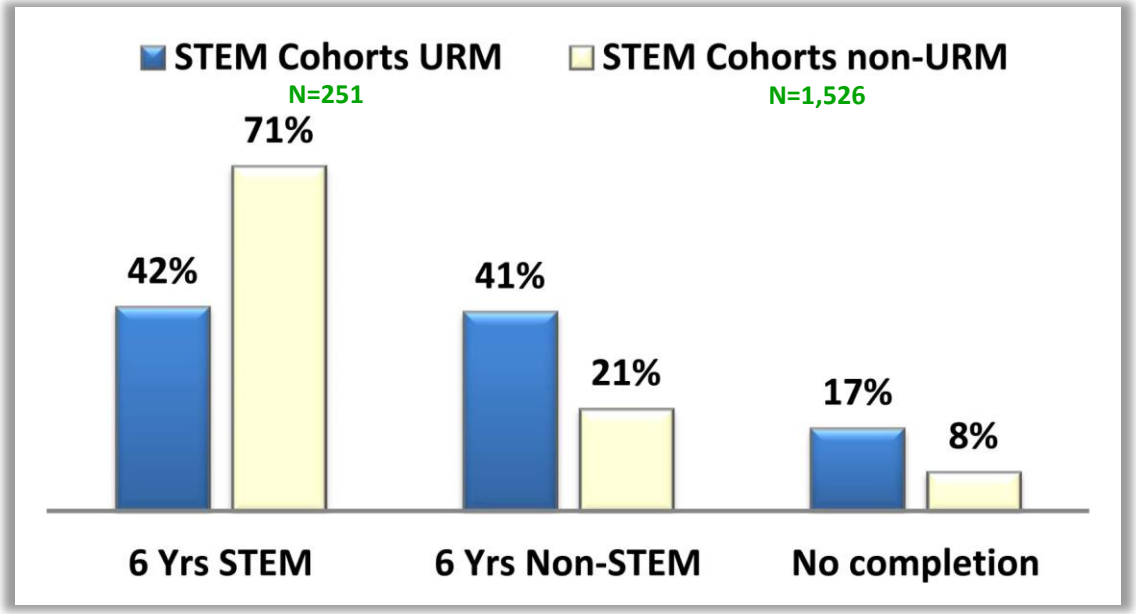


UCLA Persistence Trends in STEM Majors



- Continuous loss of students from STEM majors
- <u>Disproportionate</u> loss of URM students compared to non-URMs

UCLA Graduation Trends Among STEM Majors

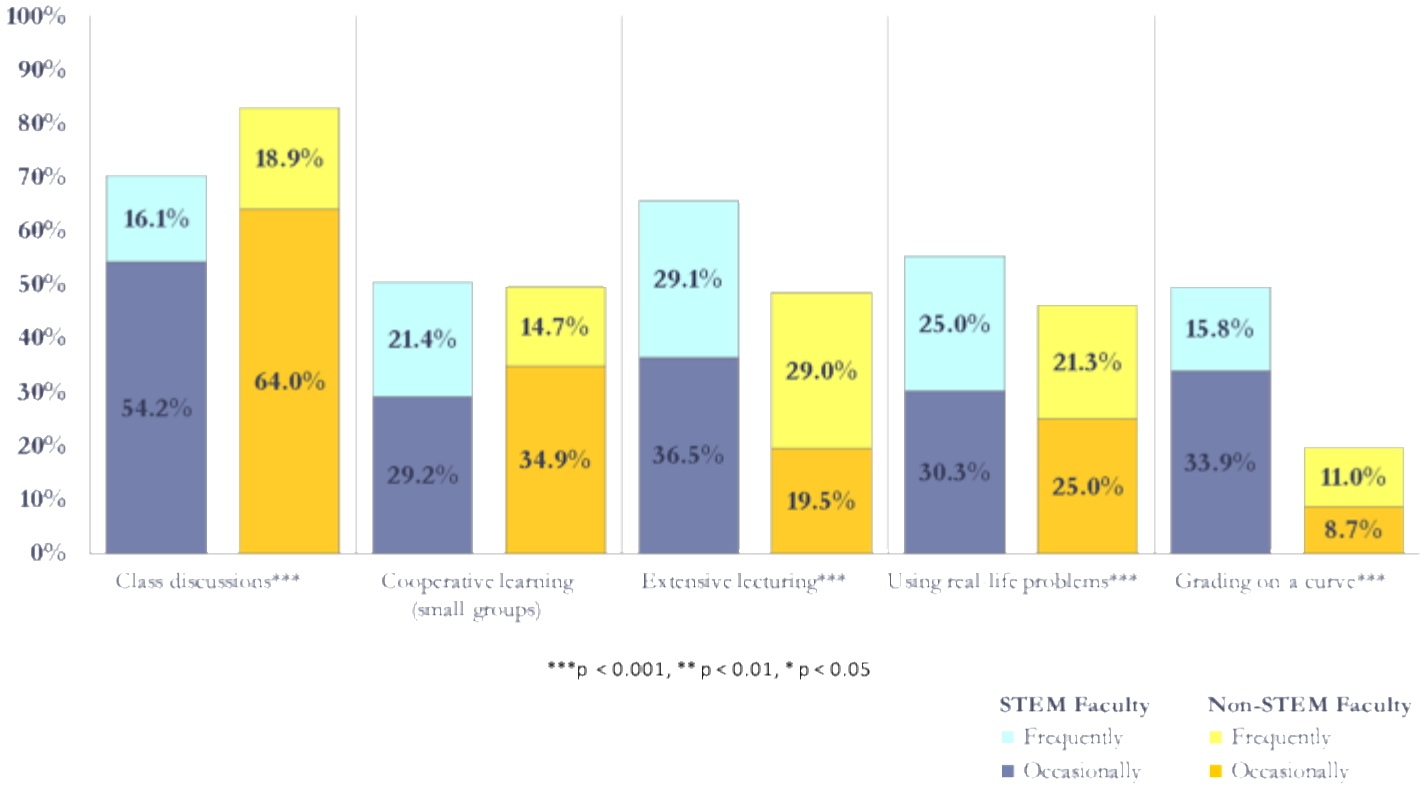


- Disproportionate percentage of…
  - URM completers compared to non-URMs
  - URM switchers to non-STEM majors compared to non-URMs
  - URMs do not complete their degree as compared to non-URMs

What's prompting students to switch to non-STEM majors or leave STEM all together at UCLA?

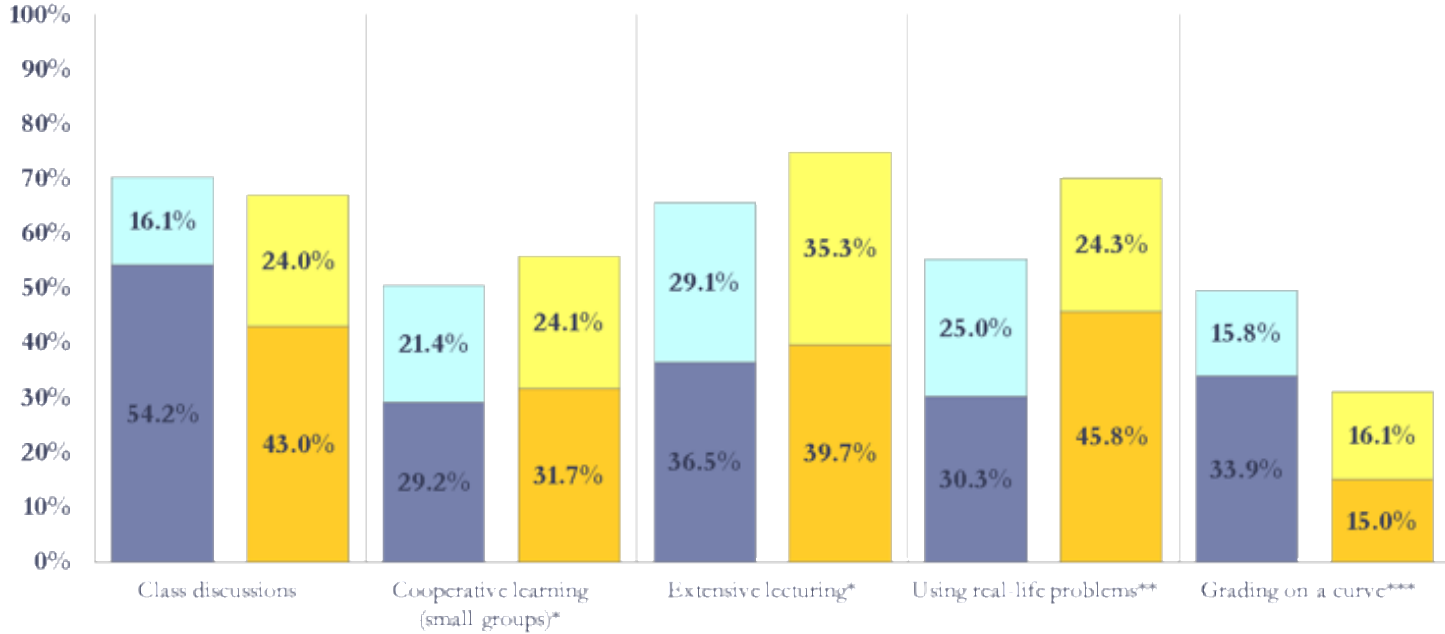
UCLA Faculty's Teaching Methods

These items measure the frequency with which faculty utilize the following pedagogical methods in their courses.



Teaching Methods

These items measure the frequency with which faculty utilize the following pedagogical methods in their courses.



Enhancing Faculty Pedagogy

Hire Discipline-Based Educational Researcher (DBER) fellows

DBER Fellows worked with lecturers and ladder faculty to develop student-centered lesson plans, write clicker questions, and facilitate student-centered practices in the classroom

Provide faculty and research team with formative and summative feedback about this transition

Campus-Wide Partnership

Chair of the life sciences core

Director of the Center for Educational Innovation in the Life Sciences

Associate Dean of the Life Sciences for Academic Programs

Managing Director of the Higher Education Research Institute

Faculty in the life sciences

DBER fellows

Institutional research representatives

Data Collection

- Classroom Observation Protocol for Undergraduate STEM (COPUS)*
- Graduate student observers
  - Characterize how faculty and students spend their time
    - Faculty: Lecturing (Lec), posing a question (PQ), clicker question (CQ)
    - Students: Listening (L), student question (SQ), worksheet group work (WG)
  - Two-minute intervals
  - Introductory Life Science courses
  - Summarize the extent of teaching and learning practices

*Smith, Jones, Gilbert, & Wieman (2013)

You are: Kevin Eagan

GORP

Workshop Demo - Cool 1 - 5:54 AM - -
Protocol: COPUS

Save Observation

End Observation

Student

Time

9:11:12

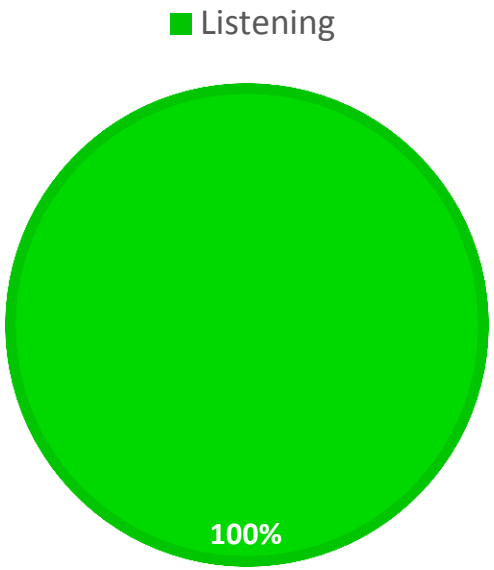
Time Remaining

0:48

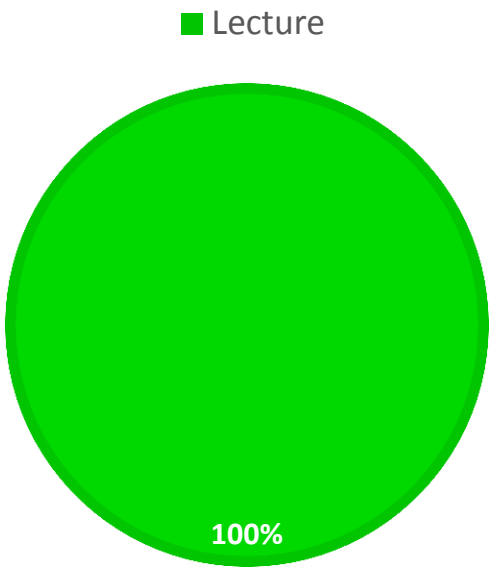
Engagement

Instructor

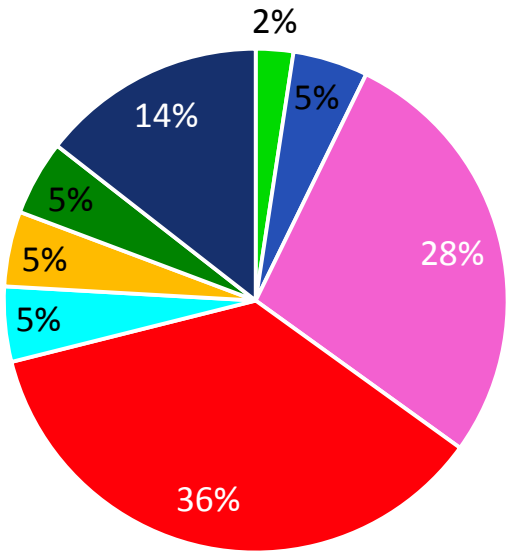
FALL 2015 LS2 - STUDENT



FALL 2015 LS2 - INSTRUCTOR

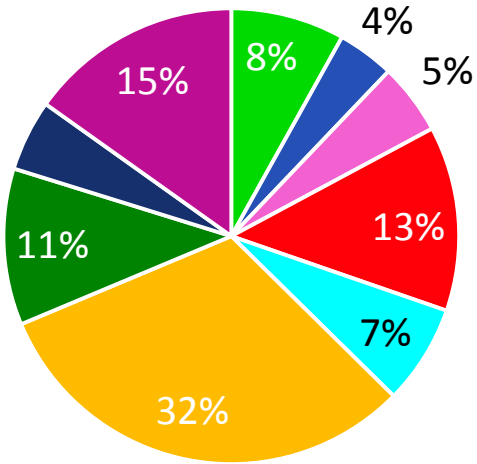


STUDENT - SPRING 2016 LS2



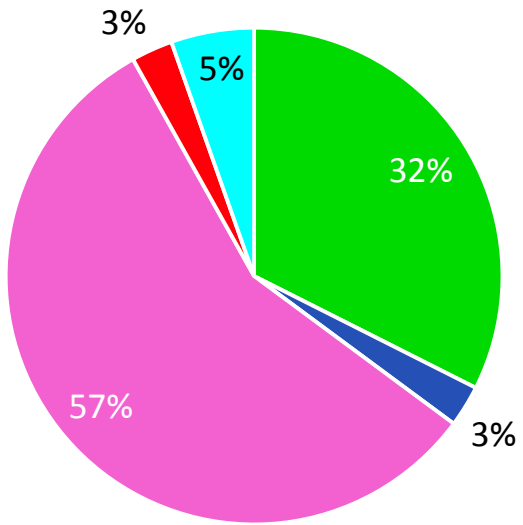
- Answering Questions
- Clicker Questions
- Independent Thinkkng
- Listening
- Predicting
- Ask question
- Waiting for instructor
- Working in Groups

INSTRUCTOR - SPRING 2016 LS2



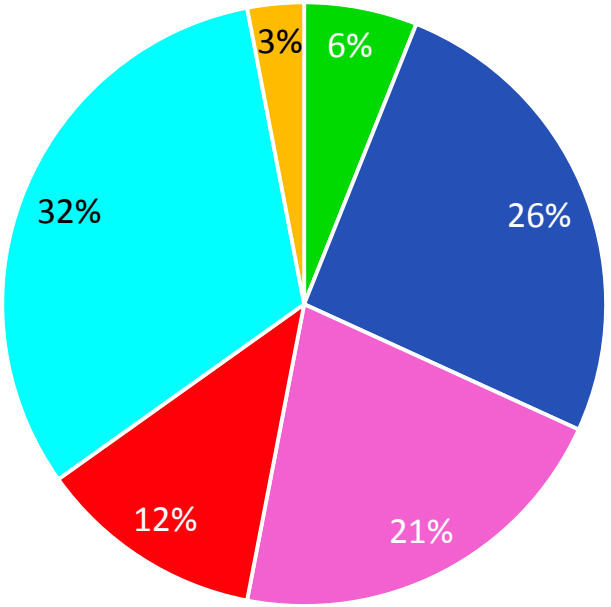
- 1to1 Interaction
- Administrative/announcements
- Answering Questions
- Clicker Question
- Follow-Up to Questions
- Lecture
- Moving through Groups

STUDENT – SPRING 2017 LS2



- Clicker Group Discussion
- Independent Thinking
- Listening
- Predicting
- Writing

INSTRUCTOR – SPRING 2017 LS2



- Administrative
- Clicker Questions
- Follow Up to Clickers
- Lecturing
- Real-Time Writing
- Waiting

Data Collection cont.

- Pre/post concept tests
  - Direct measurement of student learning by pedagogy
- Pre/post student surveys
  - Measure students' self-efficacy to think and act like scientists
  - Experiences in the course
- UCLA Registrar's Office
  - Retention in STEM major
  - Course grades

Results

Figure 1. LS2 Concept Test Scores by URM Status and Pedagogy

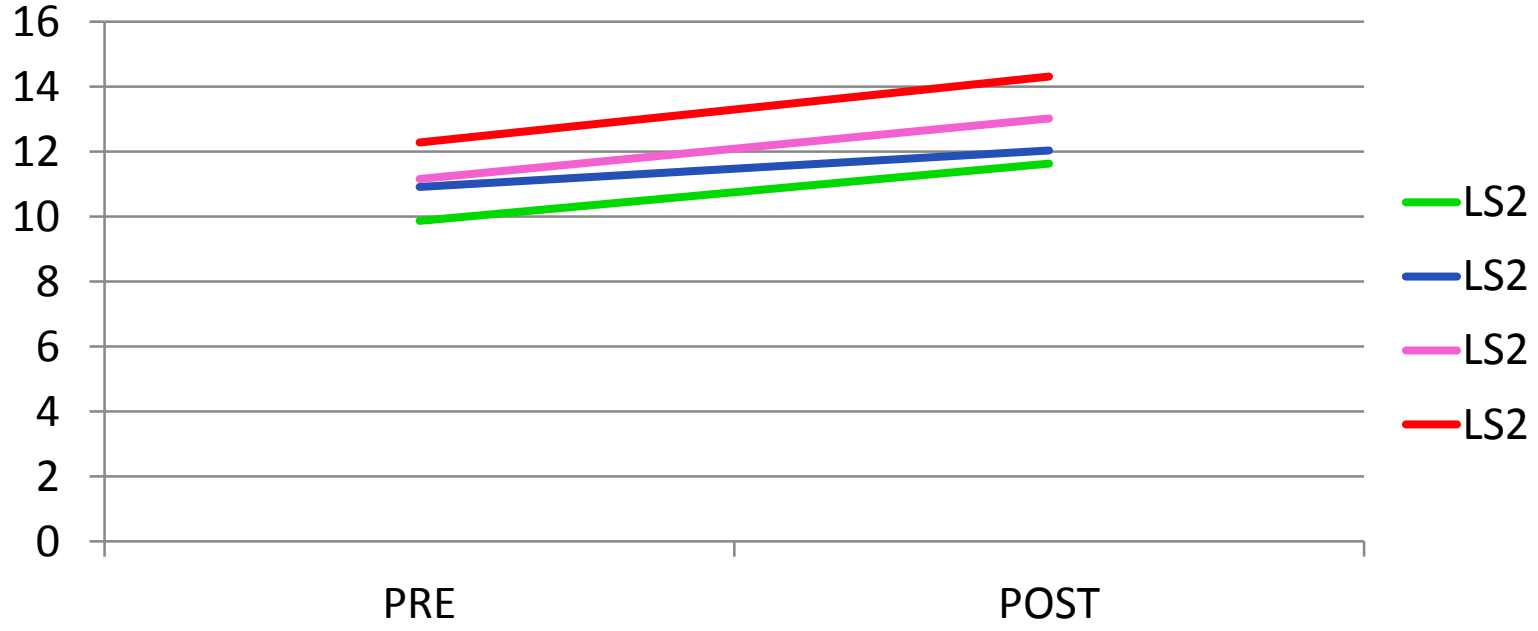


Figure 2. LS3 Concept Test Scores by URM Status and Pedagogy

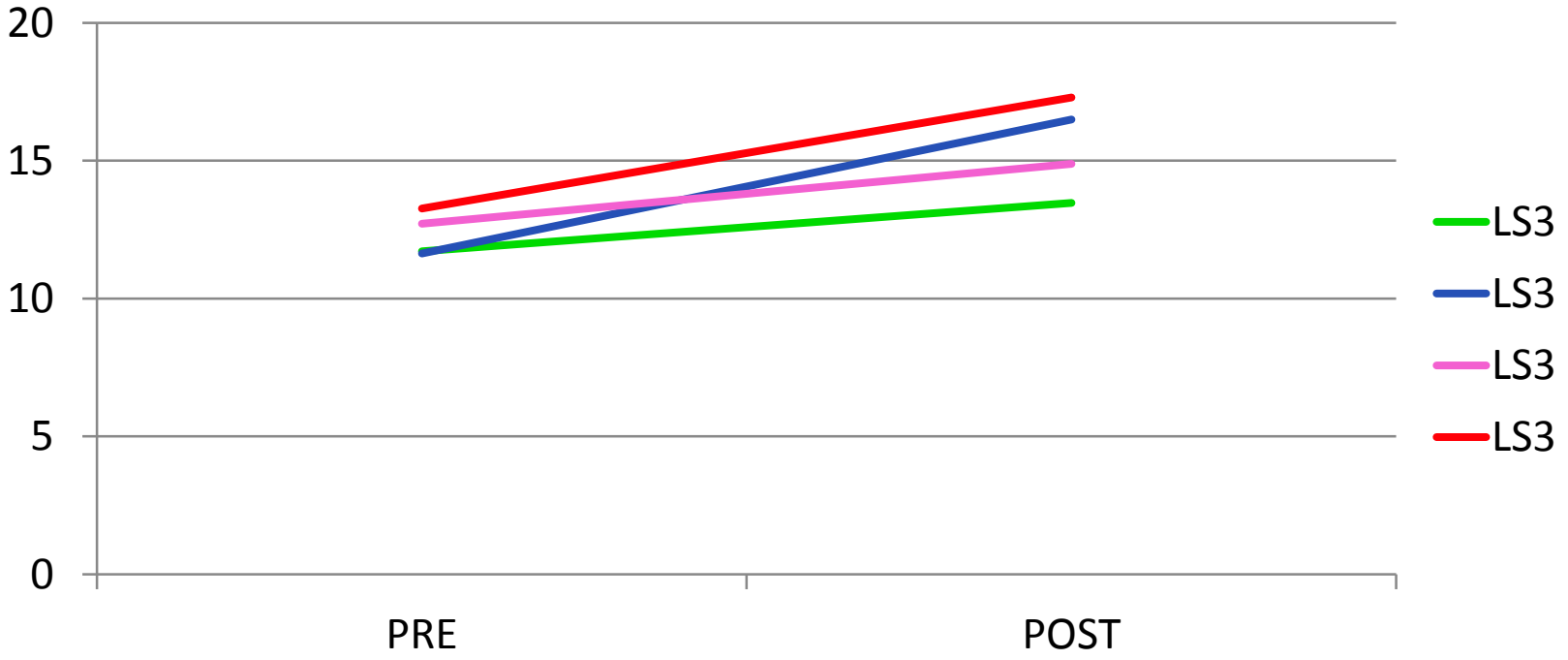


Figure 3. LS4 Concept Test Scores by URM Status and Pedagogy

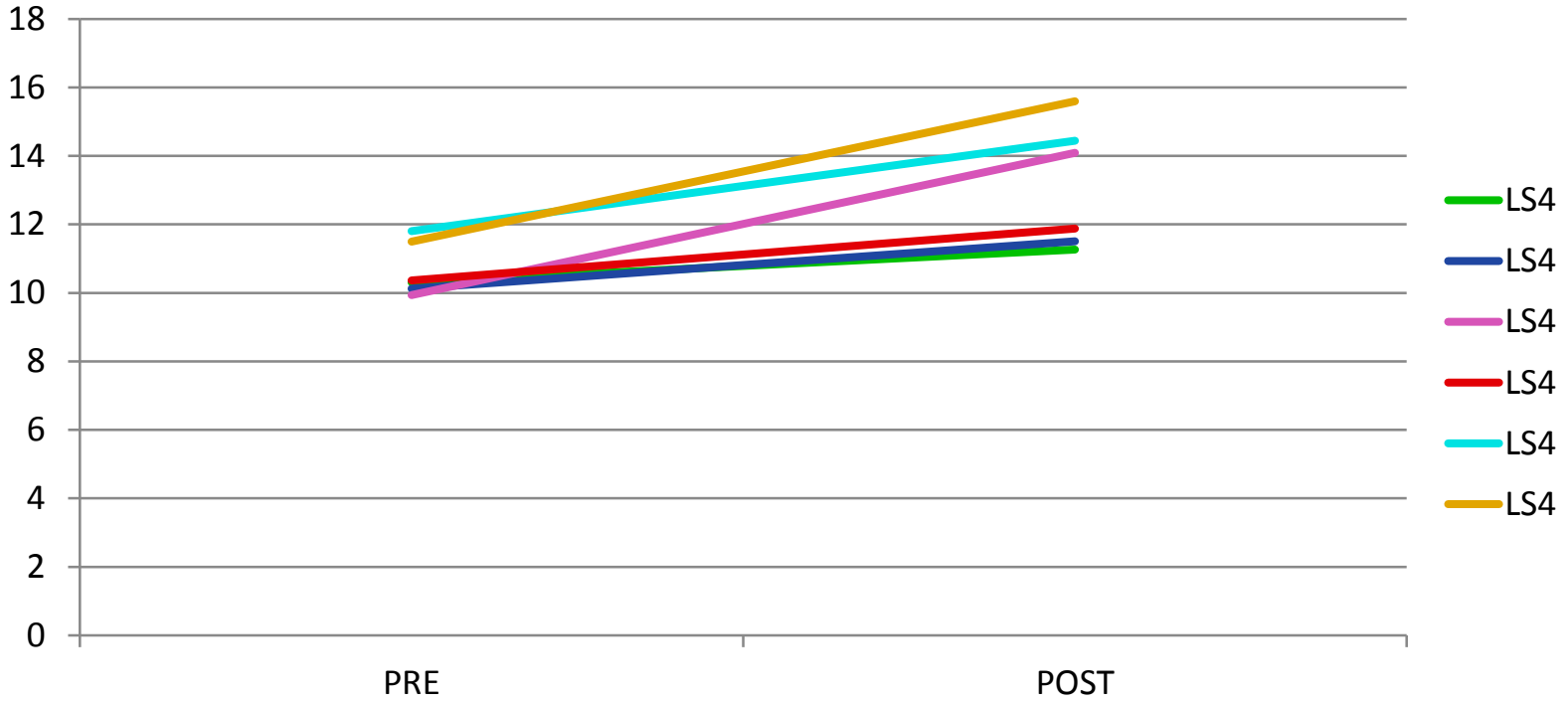


Figure 7. LS2 Concept Test Scores by First-Generation Status and Pedagogy

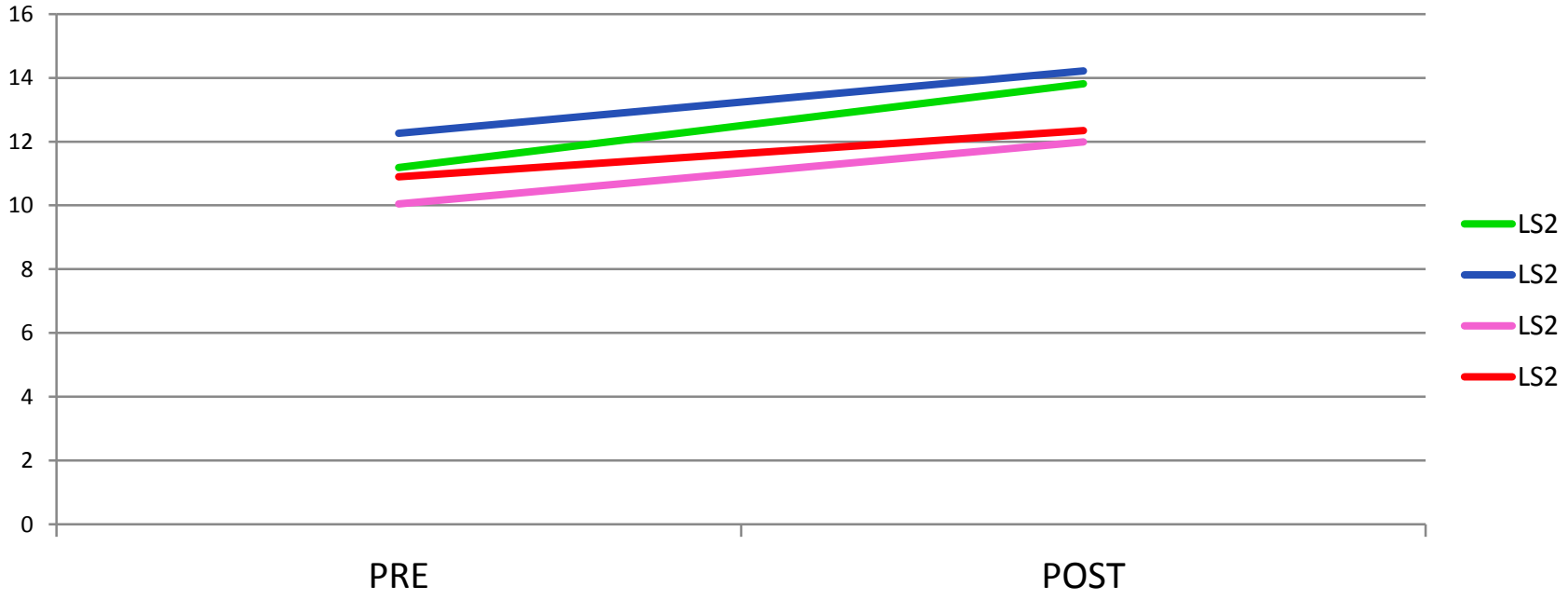


Figure 8. LS3 Concept Test Scores by First-Generation Status and Pedagogy

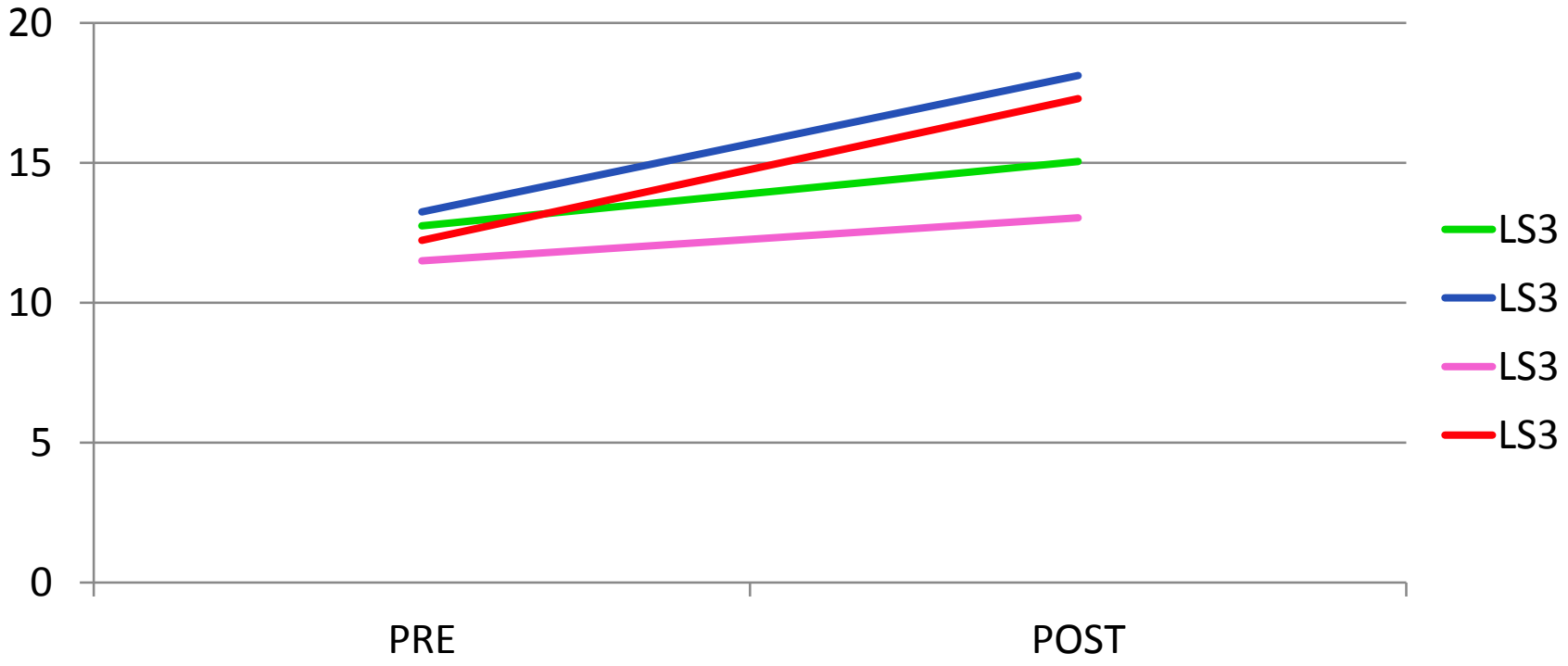
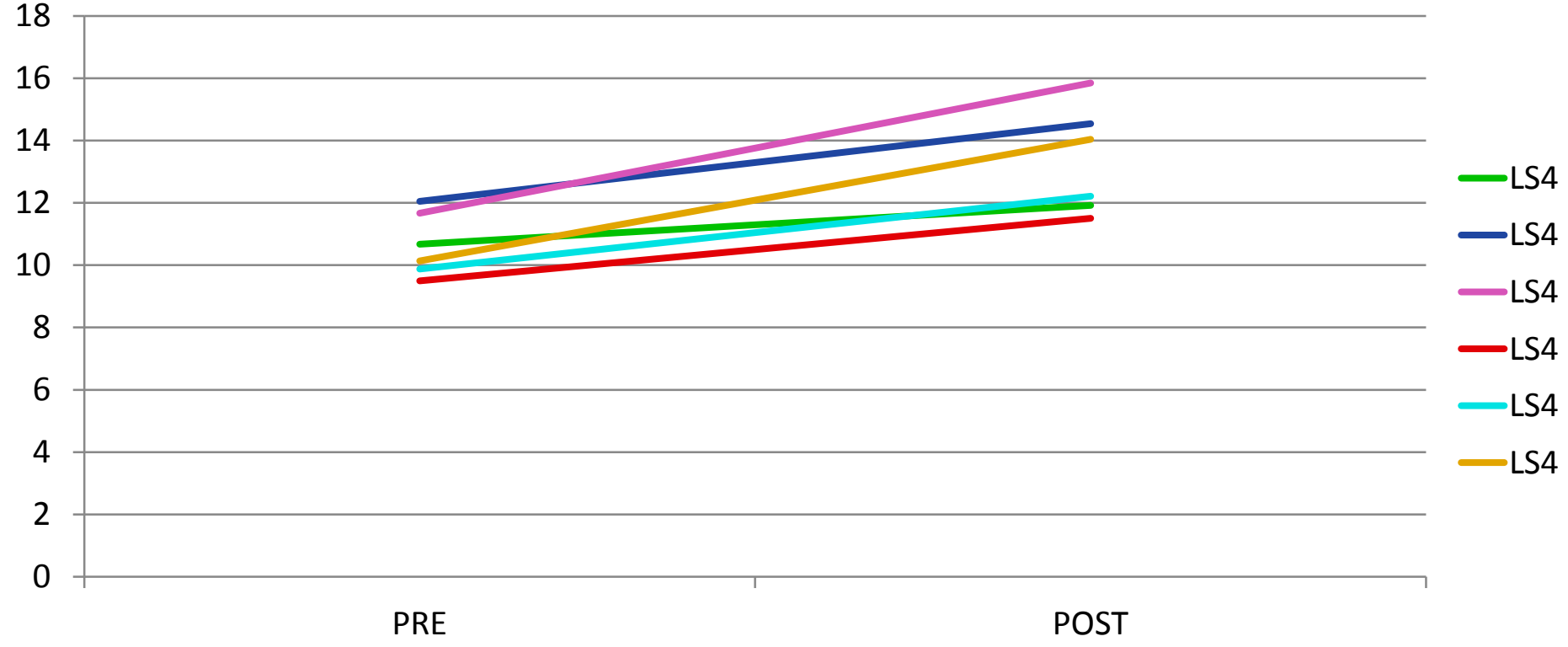


Figure 9. LS4 Concept Test Scores by First-Generation Status and Pedagogy



Implications and Next Steps

Highlighting findings with team

- Encourage faculty to persist with use of active learning strategies
- Review COPUS findings about extent of student-centered teaching in active and flipped classrooms

Enhancing faculty teaching practices in other divisions

Disseminating results more broadly