Connecting Instructional Assessment, IR Data, and Student Success

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CAIR Annual Conference
November 16, 2016

UCLA

Presentation Overview

- Introduction to:
  - Classroom Observation Protocol for Undergraduate STEM (COPUS)
  - General Observation Reporting Protocol (GORP)
- Case study: UCLA bioinformatics course
- Activity and discussion

Classroom Observation Protocol for Undergraduate STEM (COPUS)

Protocol developed by researchers at UMaine and UBC to investigate range and frequency of teaching practices in STEM classes

- Snapshot of all classroom activities at 2-min intervals
  - Instructor and student activities
  - Pre-defined observation codes

Smith, M.K., Jones, F.H.M., Gilbert, S.L., & Wieman, C.E. (2013)

Activity Follow-up

- Discuss in groups of 2-3 (5 minutes)
  - Compare observation notes
- Large group (3-5 minutes)
  - How was the coding process?
  - What did you find after comparing notes?

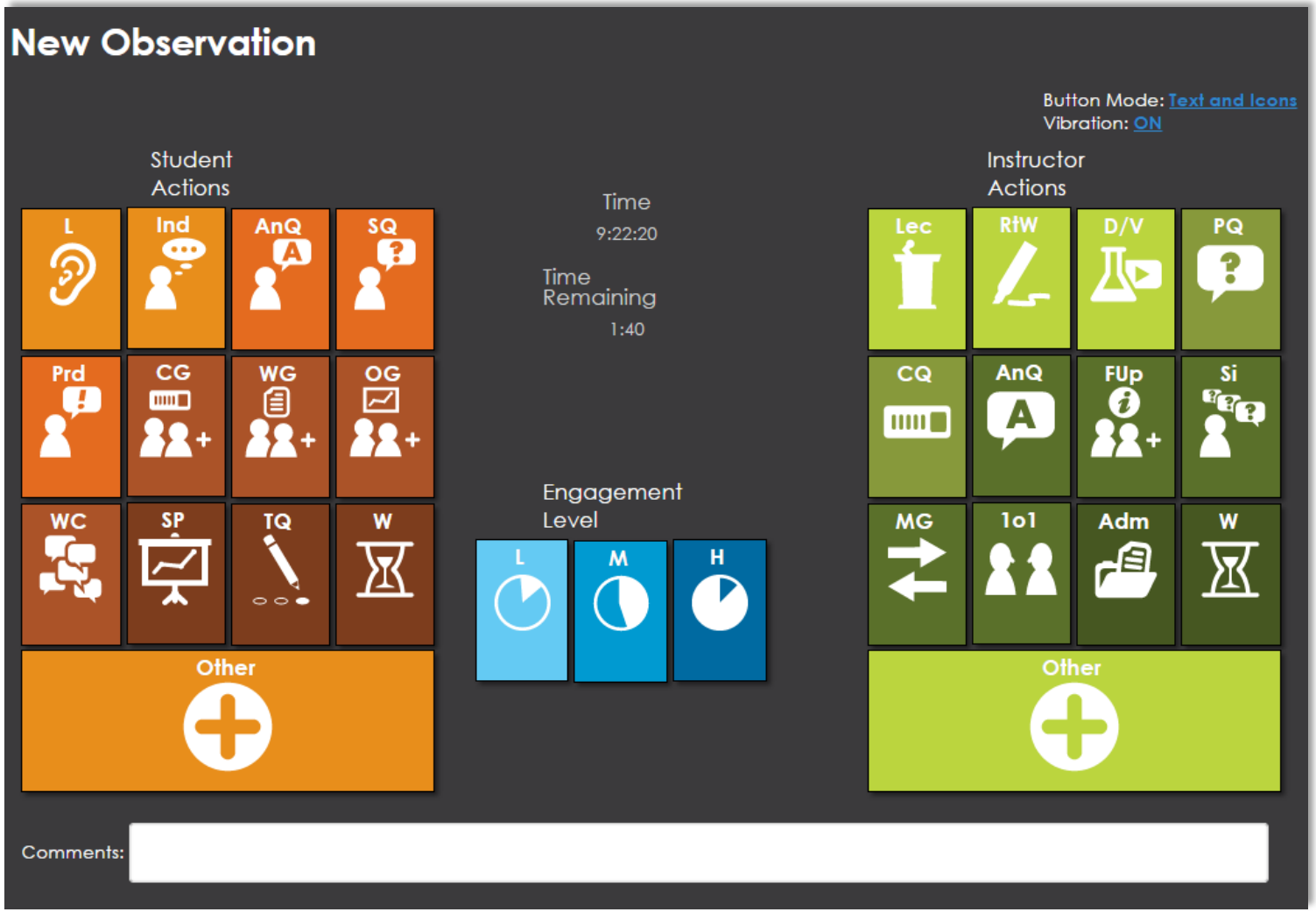
Benefits & Challenges of COPUS

- Benefits
  - Validity and reliability (IRR)
  - Can capture a range of instructional styles
  - Provides detailed info about instructional practices
  - COPUS data can be used for tenure and promotion, to develop targeted professional development
- Challenges
  - Timing, especially with multiple coders
  - Need adequate training
  - Can be difficult to capture everything
  - Paper coding cumbersome

Generalized Observation Reporting Protocol (GORP)

- Developed by researchers at UC Davis to facilitate use of COPUS
  - User-friendly interface; works on numerous devices
  - Automatically captures data at 2-min intervals
  - Allows for multiple coders and data download for inter-rater reliability (IRR) calculations
- Tool can be customized for specific activities

Generalized Observation Reporting Protocol (GORP)



UC Davis Tools for Evidence-based Action

Example: Introduction to Bioinformatics at UCLA

UCLA

Introduction to Bioinformatics

- Goals and measures for computer science (and STEM) education
  - Increase engagement
    - # questions and answers volunteered
  - Improve learning and academic performance
    - Exam scores ("Bloomed" for cognitive rigor), final grades
  - Increase persistence rates, especially among women and URM students
    - Enrollment snapshots, final grades

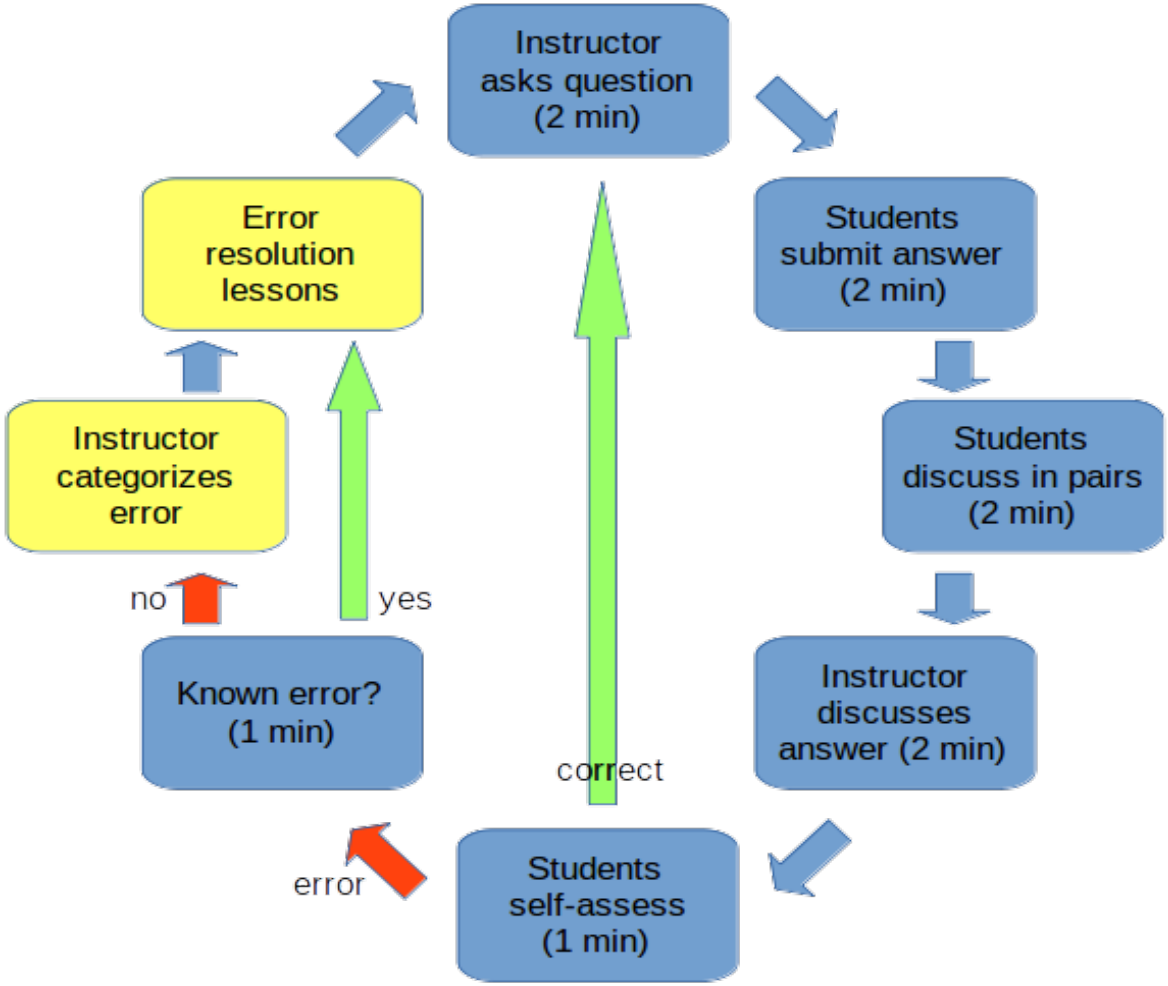
Course Timeline

Year	Major changes in course format
2003	• Bioinformatics offered as standard lecture course
2009	• Incorporate Socratic method, posing questions and soliciting student answers verbally • Switch from “grading on the curve” to grading based on previous year’s distribution
2011	• Incorporate ORCT error discovery learning, enabling each student to answer target problems via laptop or smartphone • Start compiling distinct conceptual errors made by students for each question
2012	• Build ORCT self-assessments based on identification of conceptual errors

Open Response Concept Testing (ORCT)

- Developed by UCLA faculty member as active learning tool to support conceptual understanding and reasoning
  - Interactive online tool
  - Uncovers instructor and student blind spots in understanding of course concepts
  - Generates “common errors” that help students identify misunderstandings (error discovery learning)
  - Used to customize resources and materials that students can use to re-examine and master concept

Open Response Concept Testing (ORCT)



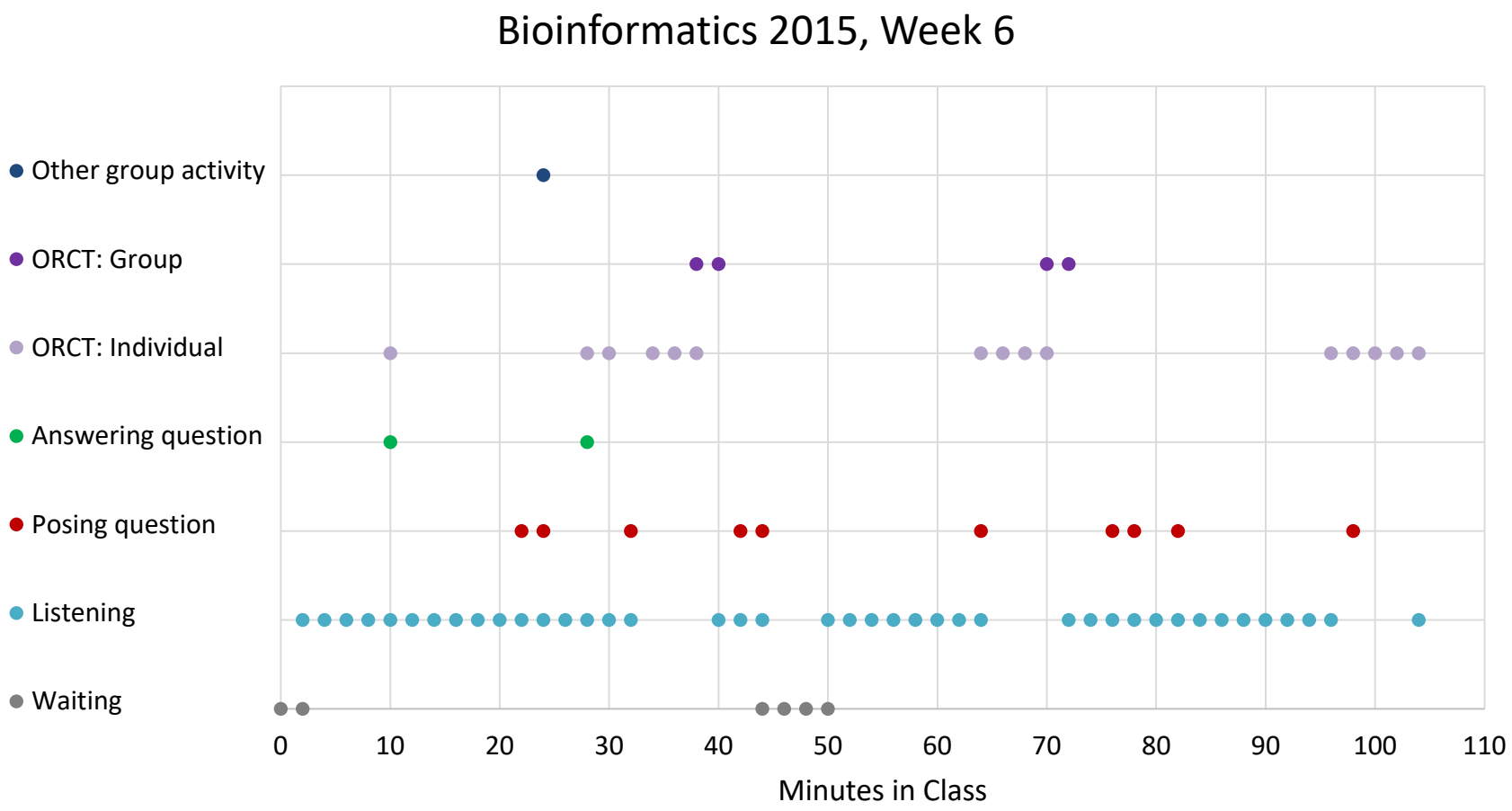
Classroom Observation Data

- Course lectures (3 COPUS coded per term)
  - Recorded lectures: 2008, 2009, 2011, 2013
  - Live observations: Fall 2015
- 2 observers per lecture (out of team of 3 researchers)
- Code for course-specific interventions
  - ORCT in lieu of Clickers and experiments/demonstrations
- Deal with limitations of lecture recordings
  - Eliminate codes for instructional activities not "observable" with video: instructor moving around the room, one-on-one conversations, etc.
  - Primarily track instructor activities since students often out of frame

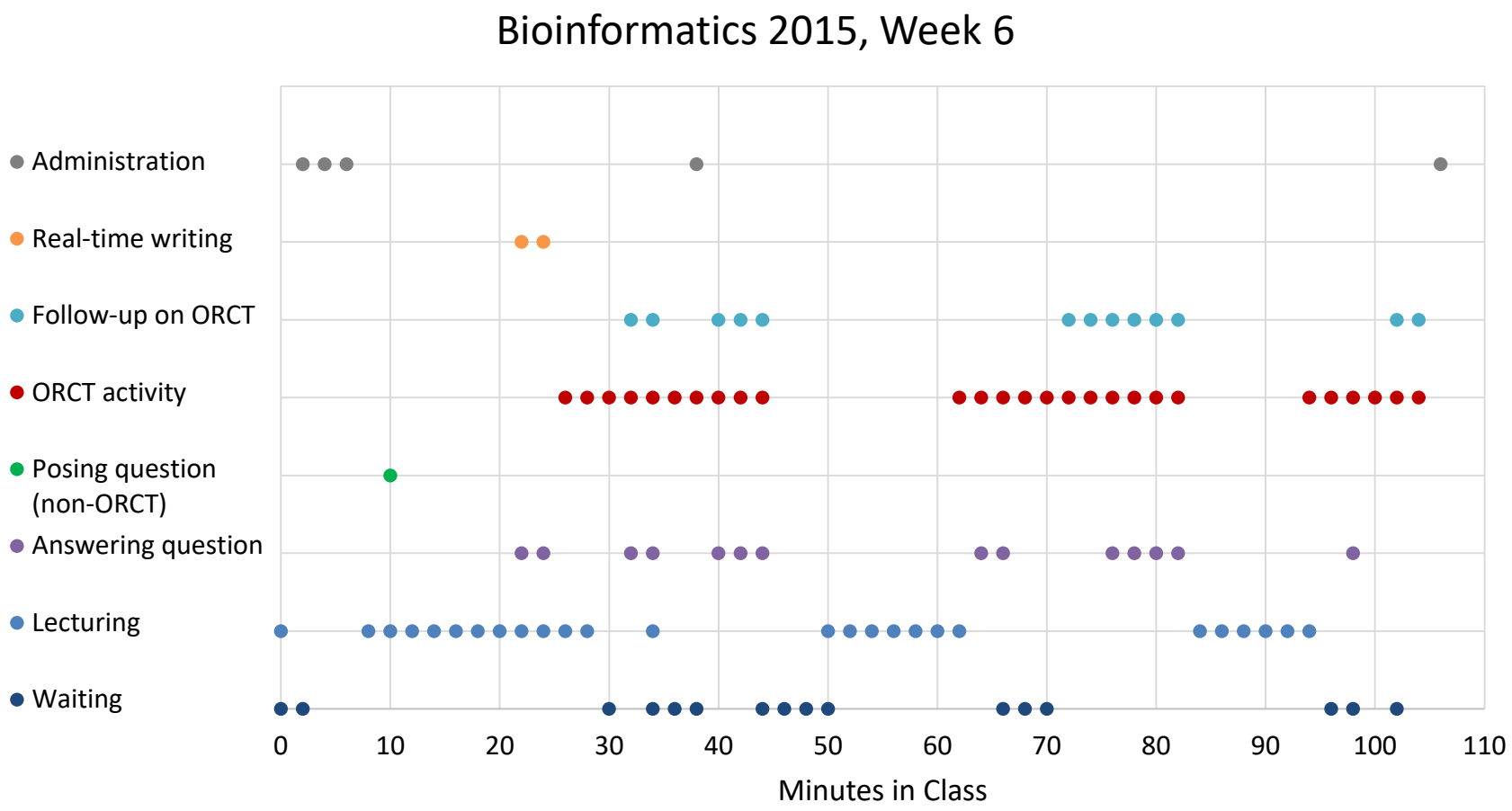
IRR Calculations: Cohen's *Kappa*

- Used for qualitative/categorical variables
- Adjusted for chance agreement (vs. raw % agreement)
- Range: 0-1*, with 1=perfect agreement
  - Generally, *Kappa* > 0.70 considered satisfactory
  - Baseline *Kappa*= 0.82 for 2013 lectures
- Calculated via preformatted Excel workbook for 2 observers
  - Alternatively via SPSS (crosstabs), Stata (kappa, kap), or SAS (proc freq)

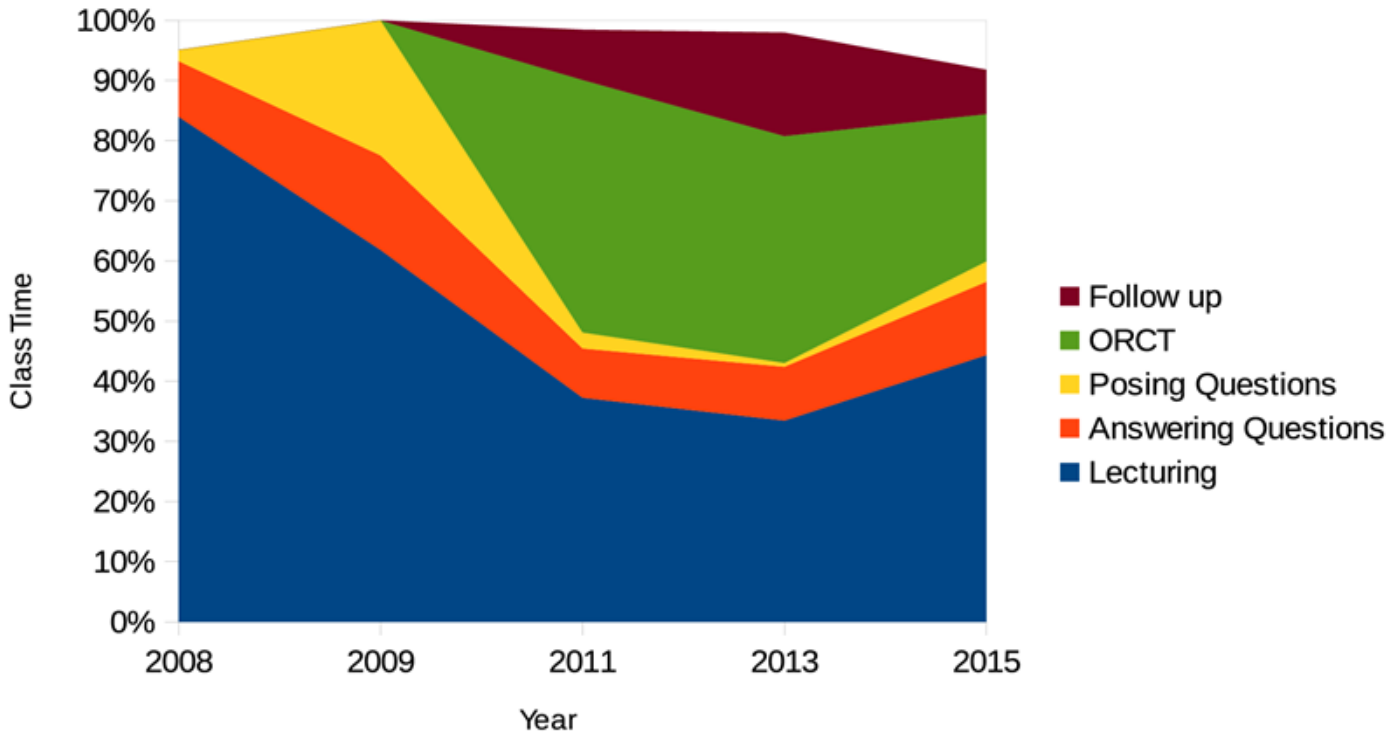
Student Activities in Lecture



Instructor Activities in Lecture

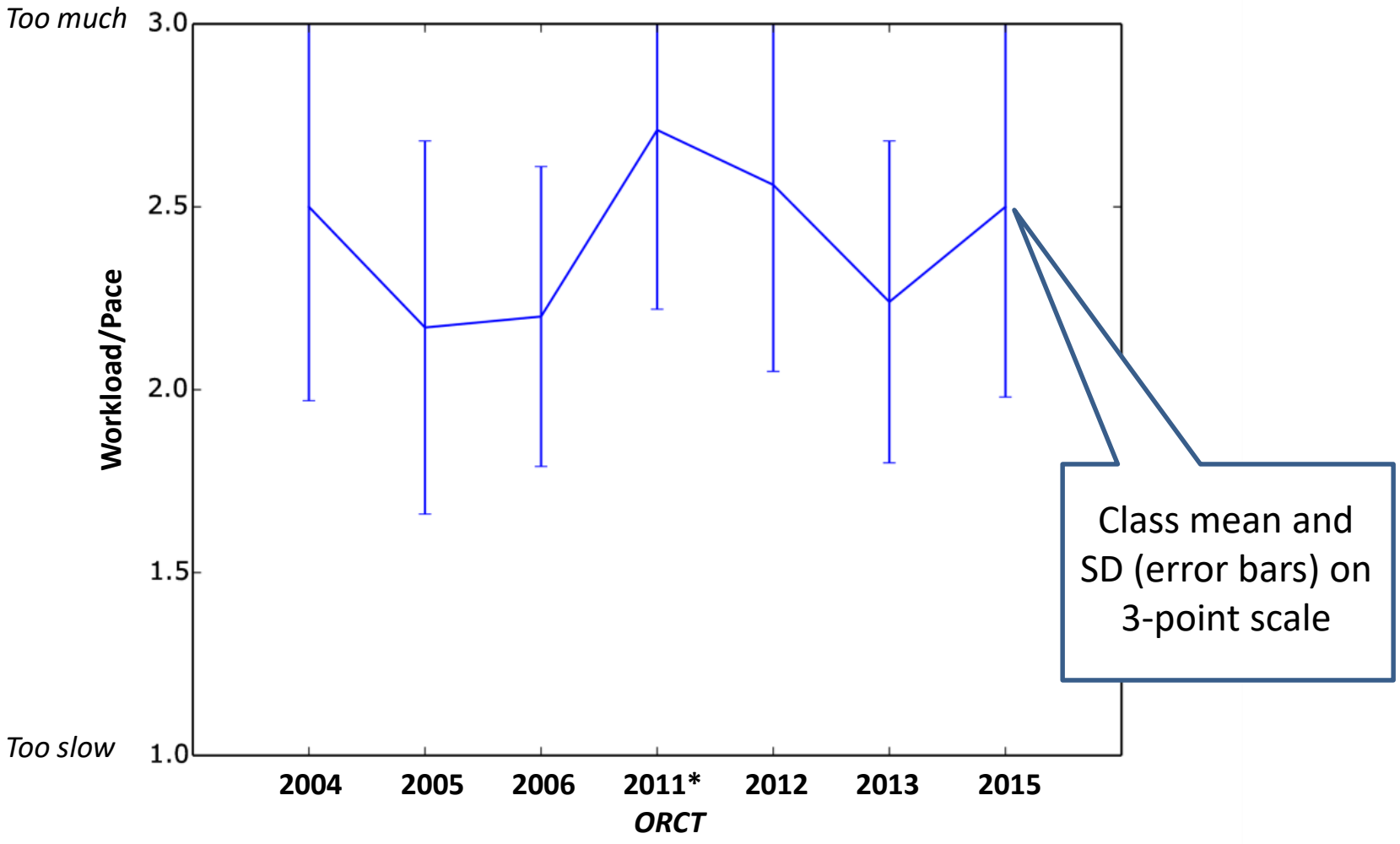


Instructor Activities Over Time

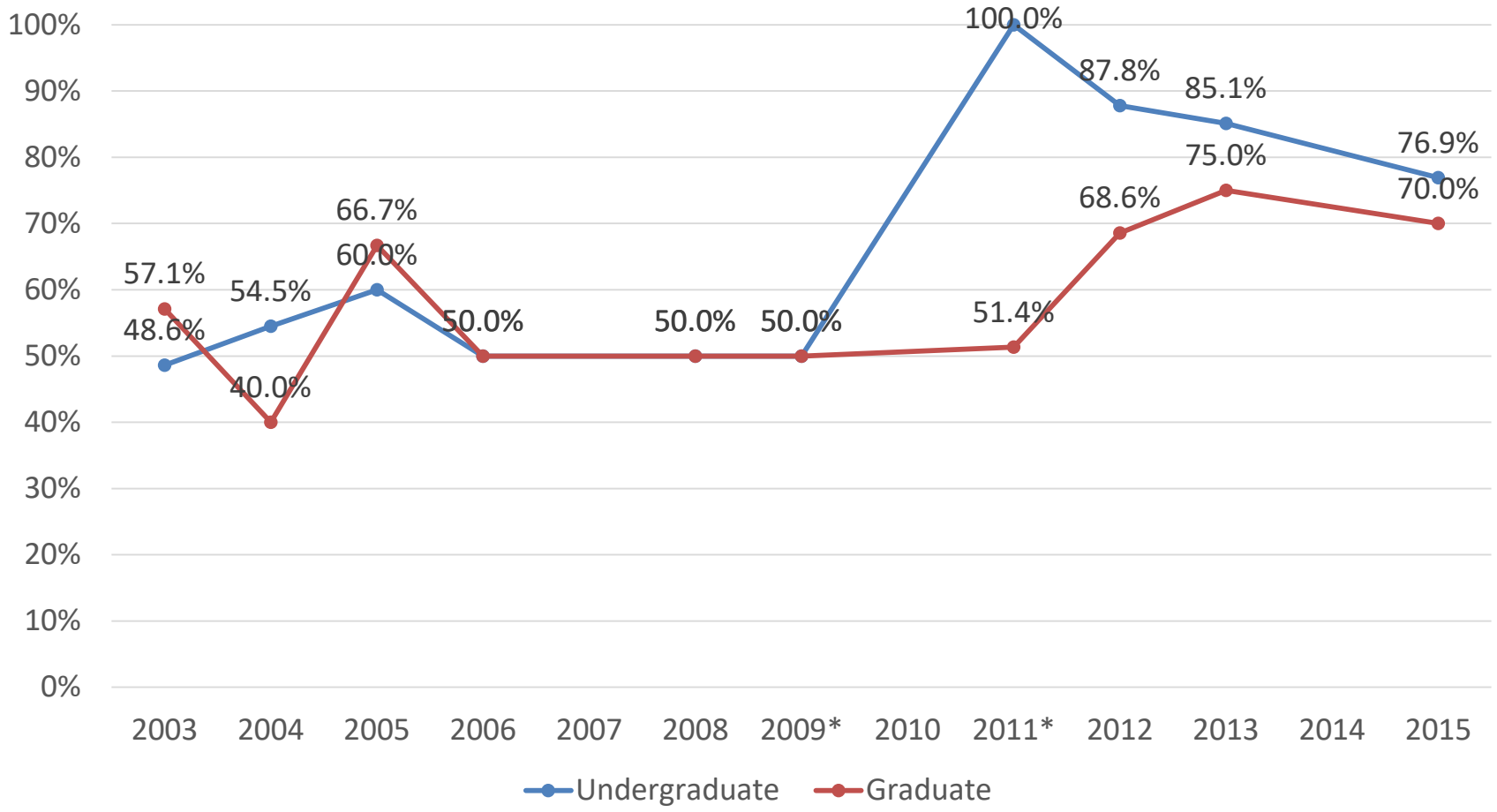


Socratic ***ORCT***

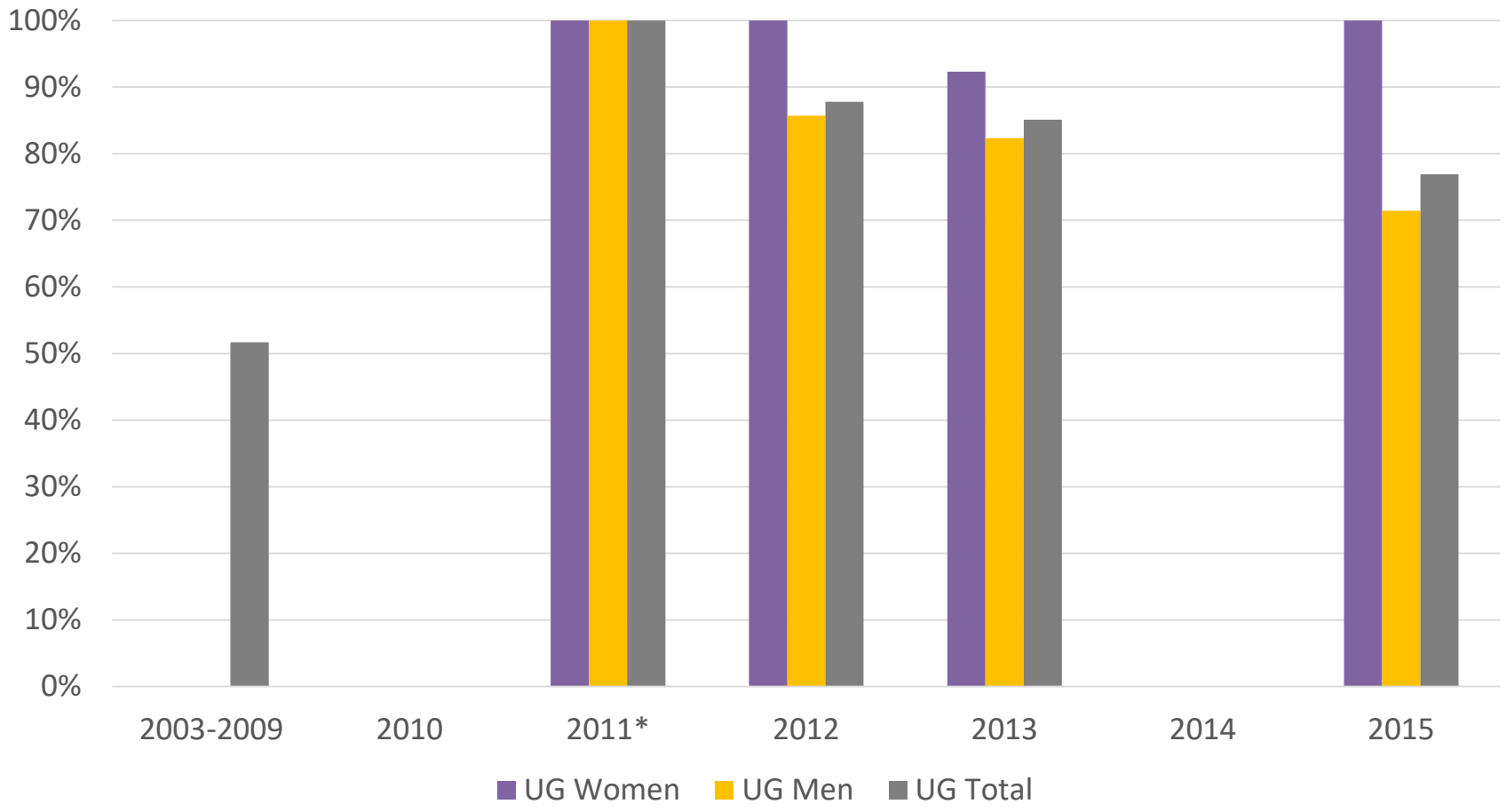
Course Evaluations



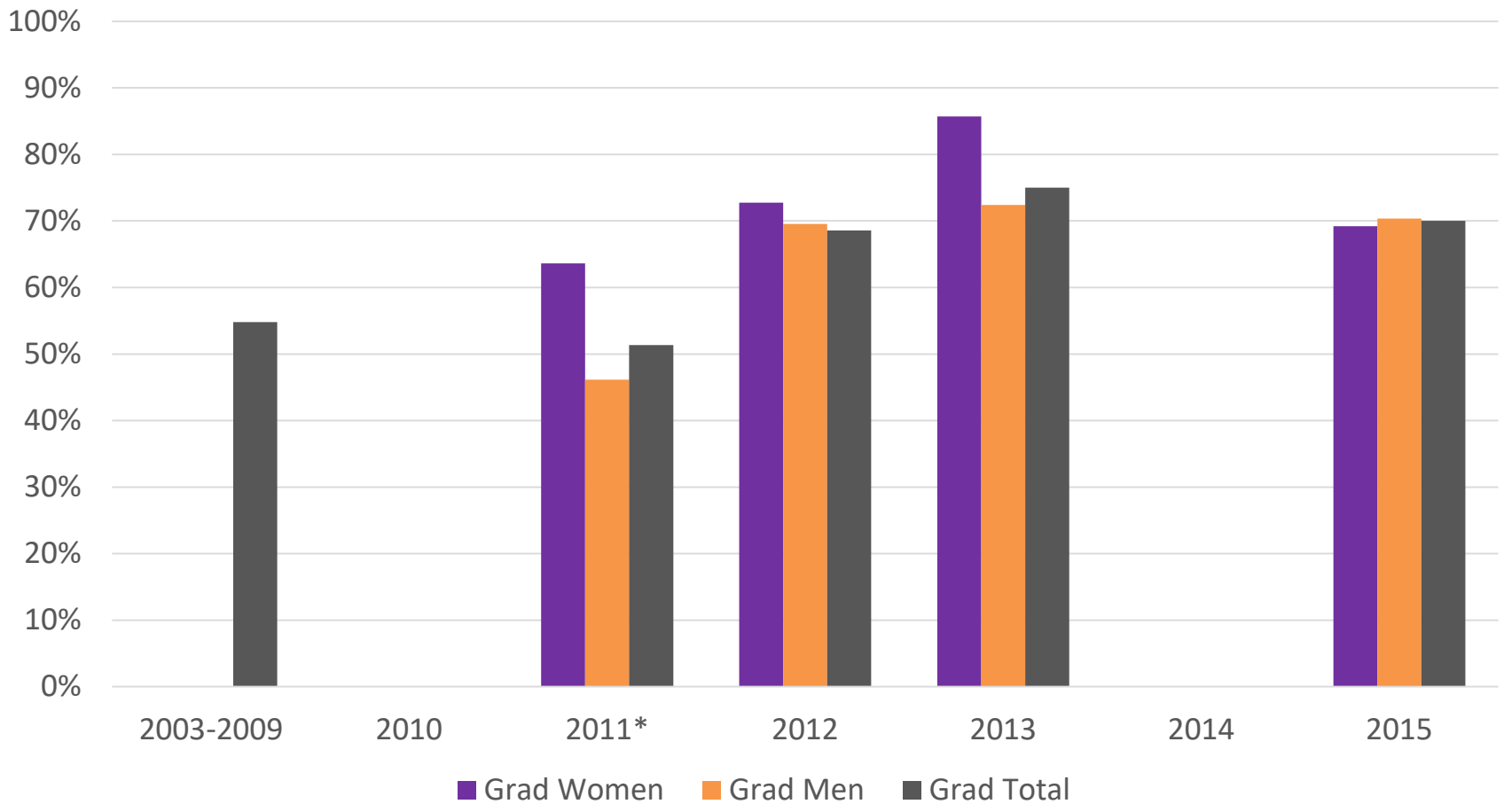
Retention Rates (Weeks 1-10), 2003-2015



UG Retention Rates (Weeks 1-10) by Gender, 2003-2015



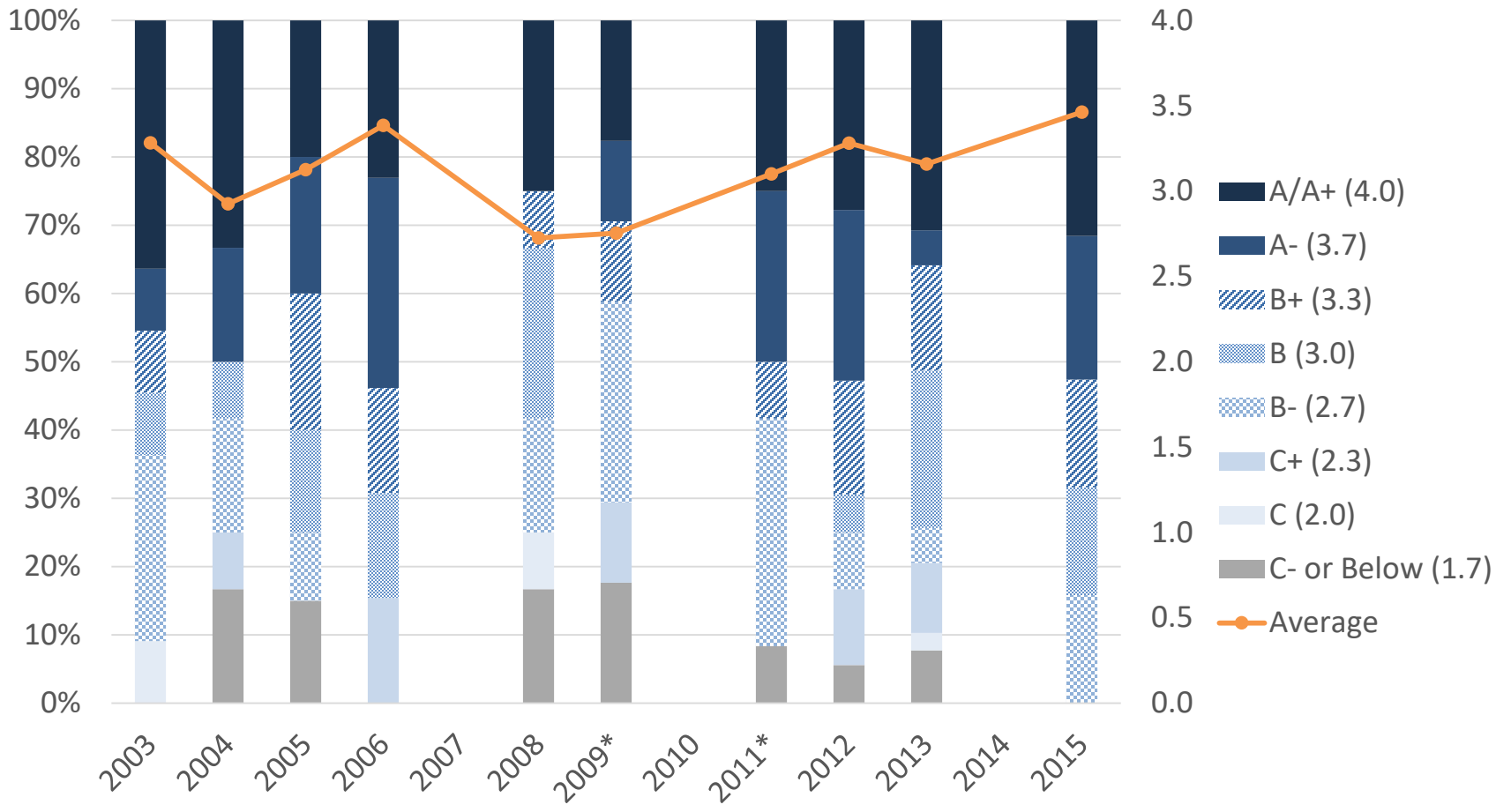
Grad Retention Rates (Weeks 1-10) by Gender, 2003-2015



UG Retention Rates (Weeks **3-10**) by Gender, 2003-2015

Grad Retention Rates (Weeks **3-10**) by Gender, 2003-2015

UG Final Grades, 2003-2015



Discussion

- What is your institution's current landscape for assessing (or proposing to assess) teaching & learning?
- What types of IR data does your campus use to assess teaching & learning?
- How might these tools be used or modified to fit your campus' assessment needs?
  - COPUS/GORP (direct observation)
  - Course evaluations
  - Application data
  - Enrollment snapshots
  - Course grades

Additional Examples of COPUS Research and Funding at UCLA

- Life Sciences Core Curriculum (NSF)
  - How are effective are LS core faculty's new/more student-centered practices?
  - Do faculty perceptions of teaching align with observable behaviors in the classroom?
- PEERS Undergraduate Research & Mentoring (NSF)
  - How effective are workshop leaders' student-centered practices in new math workshops?
  - Does math workshops' use of active learning practices impact STEM retention for students in the PEERS program?
- Lower Division Physics Courses (OID institutional grant)
  - How effective is faculty use of active learning pedagogy in making physics lectures/ discussions/labs more inclusive?
  - Does active learning pedagogy improve student retention and concept mastery in lower division physics courses?

Center for Educational Assessment
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UC Davis Tools for Evidence-based Action
http://t4eba.com

NIH National Institutes of Health
R25GM114822

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