A Correlative Study of Student Understanding and Attitude in the Natural Sciences

CARRIE NEPSTAD – ASSESSMENT CHAIR
PHILLIP VARGAS – RESEARCH ANALYST
SARAH KAKUMANU - RESEARCH ANALYST

Assessment Committee meets weekly

Routine and frequency

Human factor

[Assessment Committee Website]

Assessment Committee (AC)

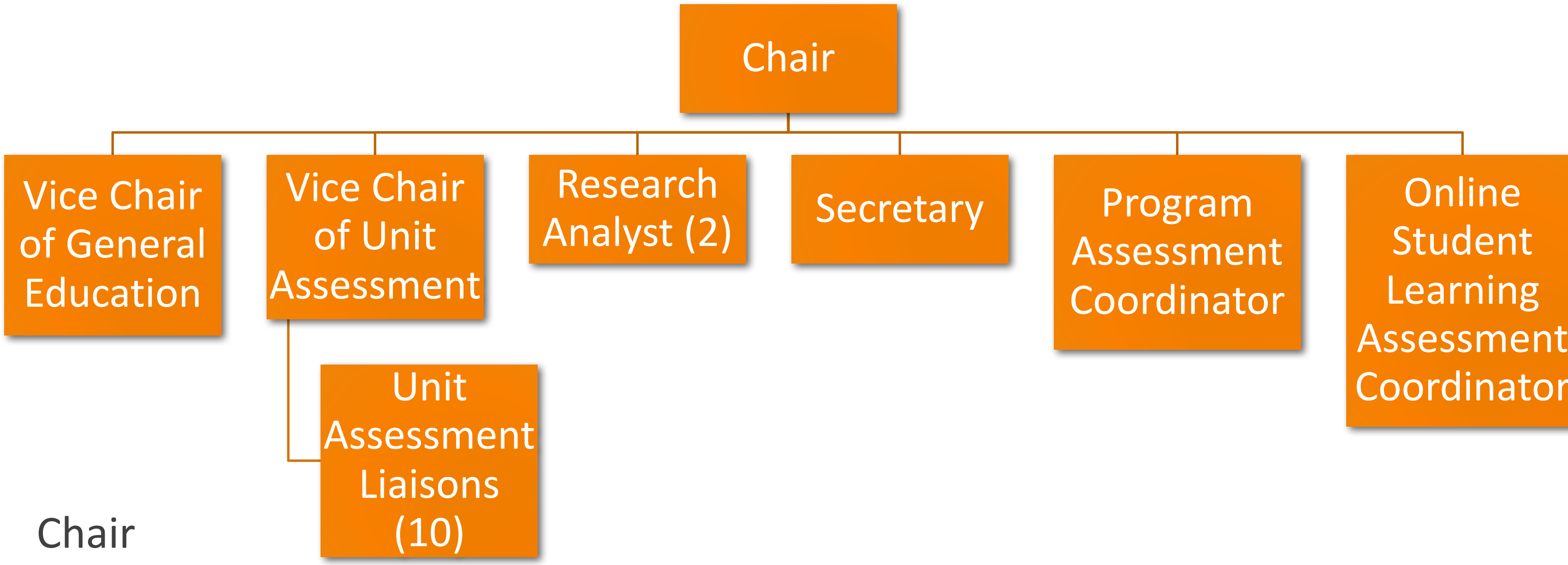
Faculty driven

- Committee primarily made up of faculty
- Representatives from every department
- Open committee meetings
- AC participation in Faculty Development Week in the Fall and an event in the Spring

Administrative Support

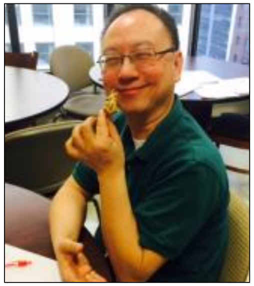
- Resources including release time during the semester and summer stipends
- Administrators participate on the committee
- AC chair meets every other week with Chief Academic Officer (CAO)/Vice President of Academic Affairs
- Administration reads AC reports

Assessment Committee



- Chair
- Vice Chair of General Education
- Vice Chair of Unit Assessment: Assessment Liaison for each department (10)
- Research Analysts (2)
- Secretary
- Program Assessment Coordinator (new!)
- Online Student Learning Assessment Coordinator (new!)

Subcommittee work



SNACKS!

Camaraderie!

Annual Deliverables

Fall Semester

Faculty Development Week

Review of Summer projects

Administer one general education assessment (Natural Sciences 2015, Humanities 2016)

Fall edition of the Assessment Times newsletter

Spring Semester

Spring meeting

Dissemination of findings

Review of core documents

Special projects: Closing the Loop special edition of the newsletter, pilot projects

Spring edition of the Assessment Times newsletter

Summer: Report writing, pilot assessment tool

Assessment in the Department of Physical Sciences

2007: College-wide Physical Science Assessment – Epistemological Beliefs Assessment for Physical Science (EBAPS)

2008 – 2013 Class specific assessment

2014 Unit level assessment (Astronomy & Chemistry)

2015 Unit level assessment (Astronomy, Chemistry, & Physics

2015 College-wide Natural Science Assessment – In-house tool

2016 ?

Tool Development and Validation

Original idea (not implemented):

- General questions that span all of the natural science disciplines

10 Physical Science Content Questions

- Five disciplines (Primarily adapted from concept inventories)

10 Biological Science Content Questions

- Five disciplines (All in-house)

15 Affective Questions:

- Colorado Learning Attitudes about Science Survey (CLASS)

Tool Development and Validation

Pilots
- Spring 2015: Committee-at-large - 18 faculty samples
- Summer 2015: 103 student sample

Internal reliability
- Cronbach Alpha: 0.65 (Borderline)
- Point Biserials calculated for each questions
  - Mean: 0.44, Min: 0.10, Max: 0.58

Takeaways – Room for refinement
- Tool is measuring multiple disciplines
- Additional questions should be included
- Departments need to codify their general education SLOs

Data Acquisition Google Forms and Openbook

A complete electronic data acquisition process was implemented

- First general education assessment that asked for student identification
- First time using Openbook (Web-based reporting and analytics platform)

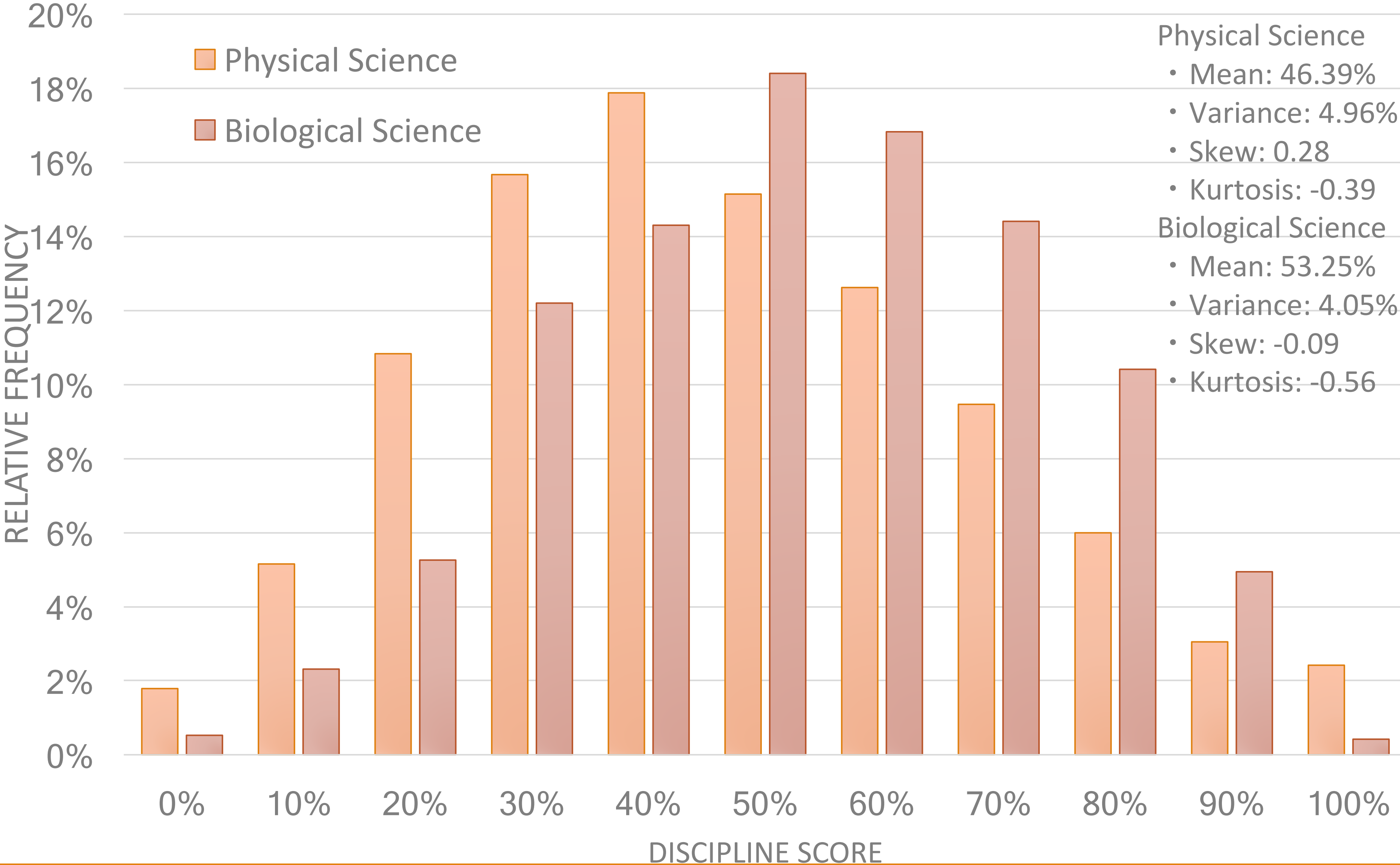
Goal:

- Improve validity of data
- Reduce testing fatigue

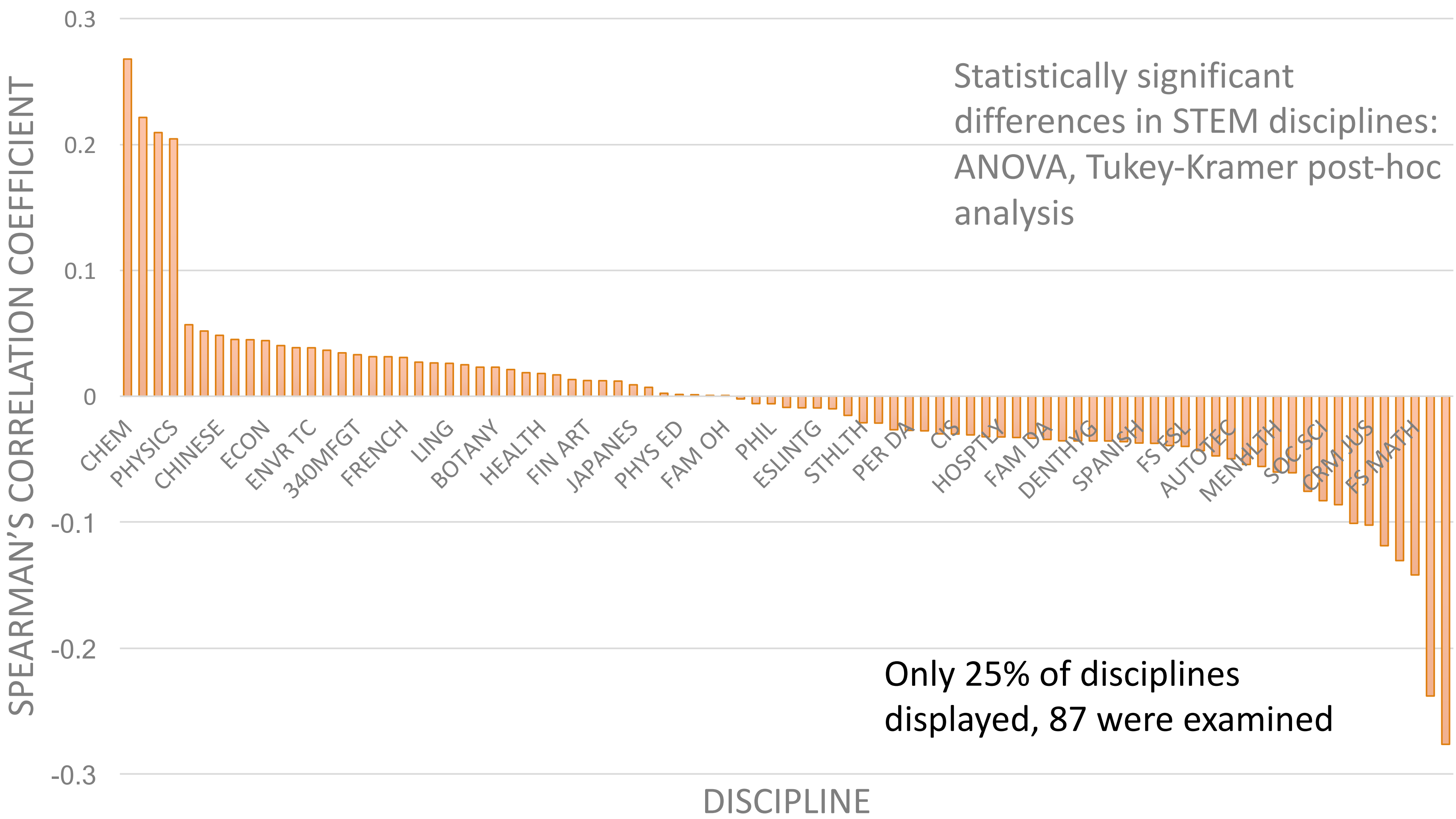
Respondents to Natural Science Survey:

- Totals: 1,050 (sample) & 9,116 (HWC credit population)
- Unique and Matched: 956, 91.0% of the survey
- Margins of error at 95% confidence level: 2.7%

Discipline Score Distribution



Correlation between Courses Taken in Discipline and Assessment Performance



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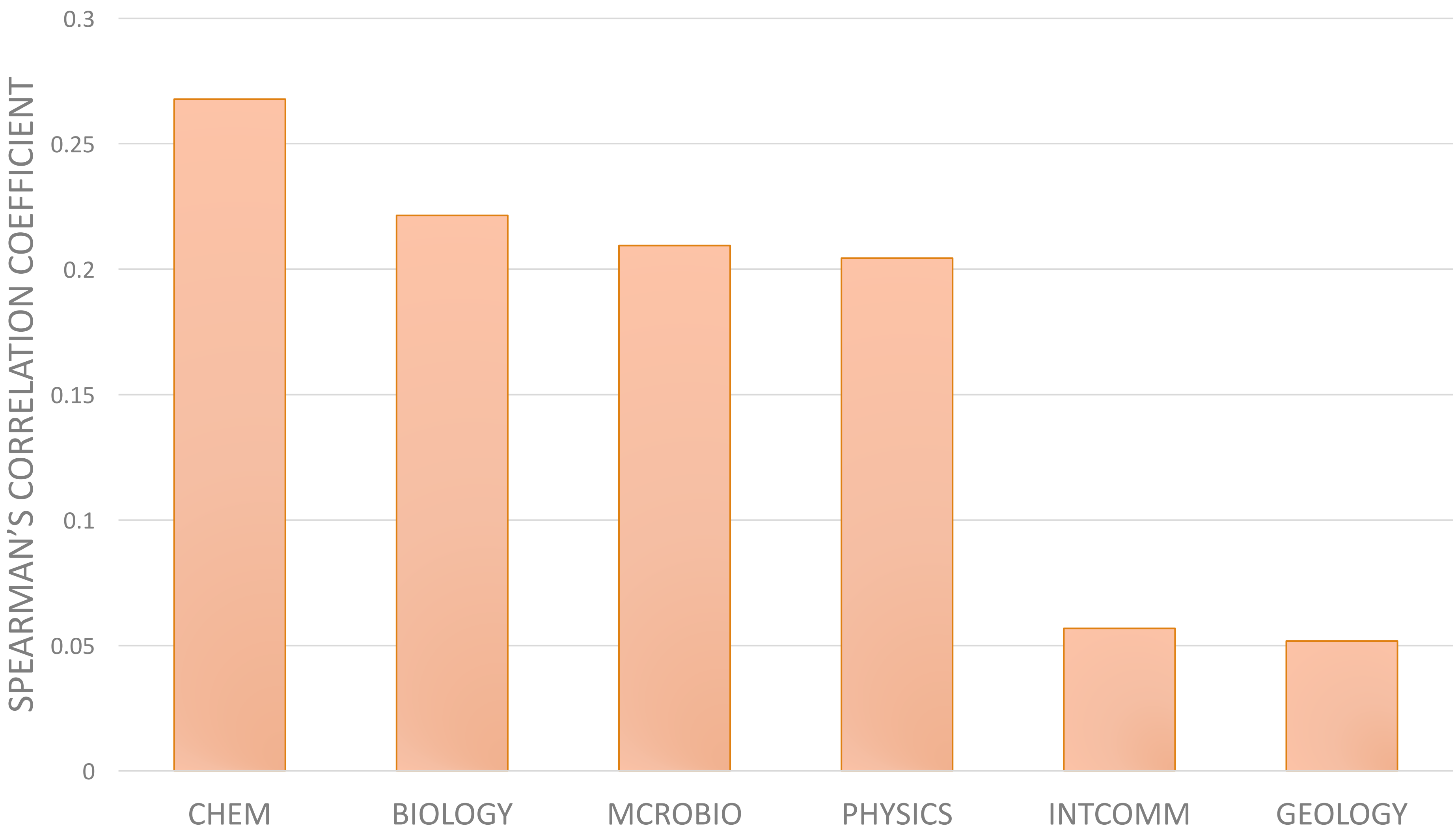

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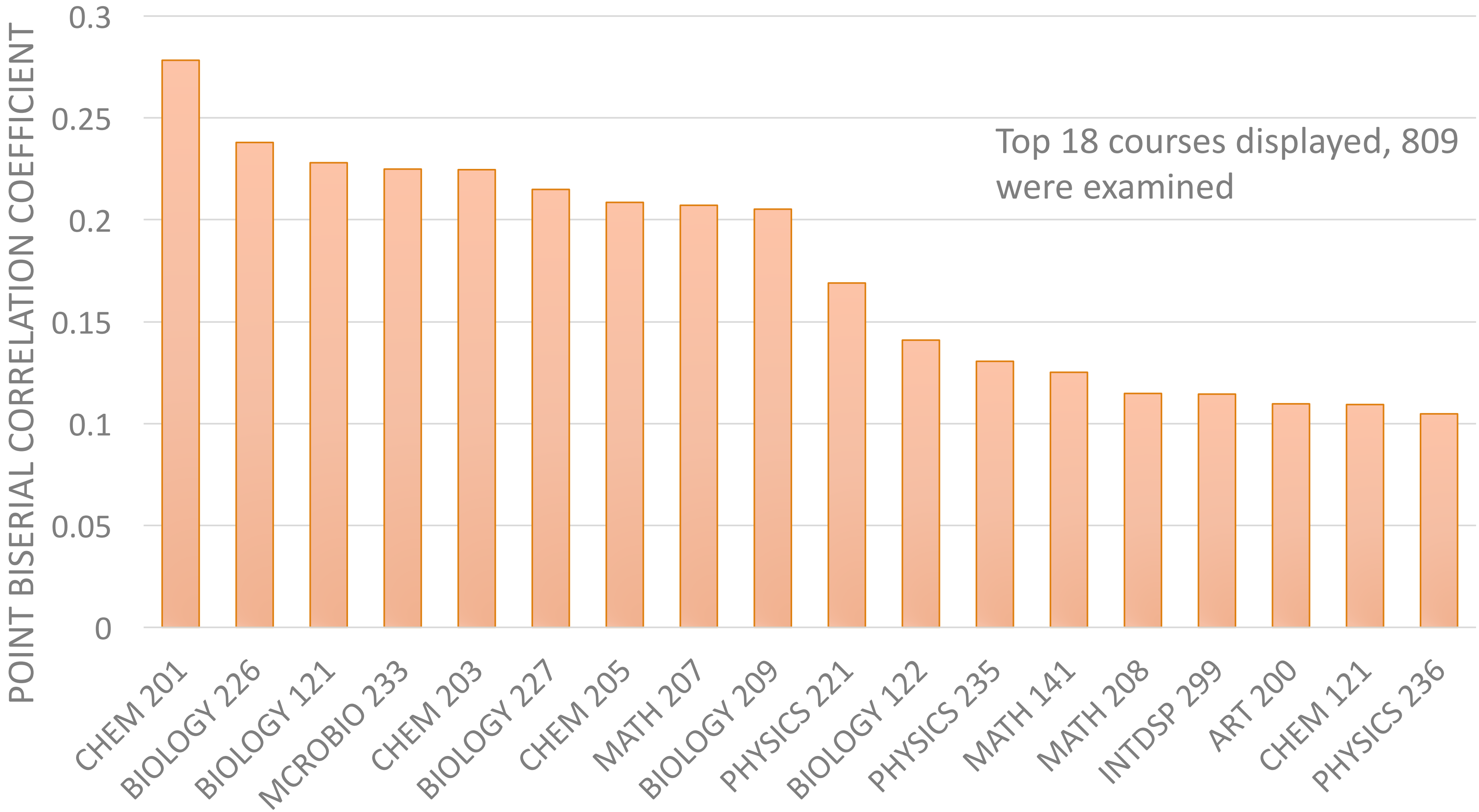


Correlations between Performance and Course History

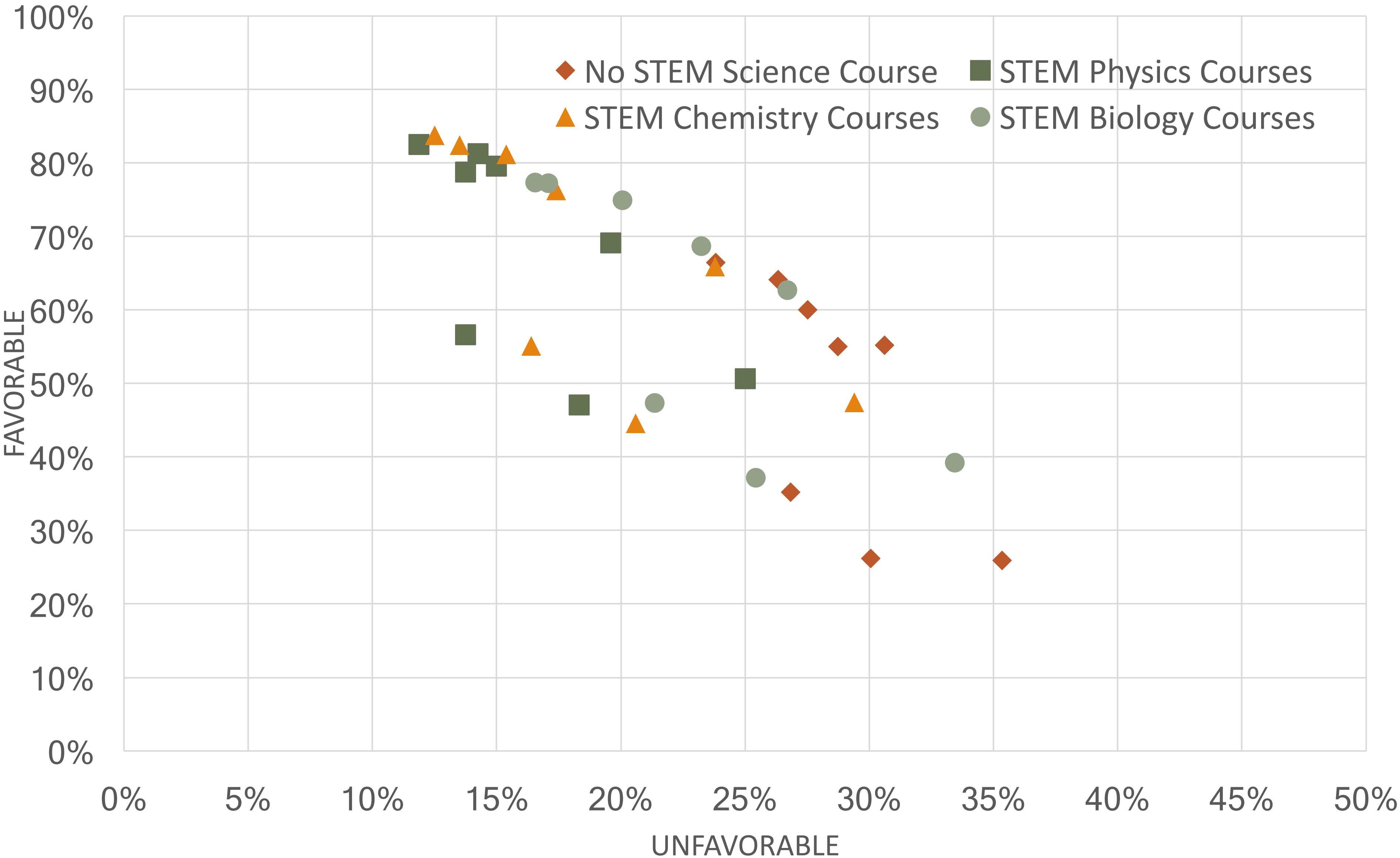
Takeaways

- Students taking STEM course perform significantly better on this assessment
- Previous HWCAC analysis of course history and performance needs refinement
  - Student starting point and tracks will significantly influence analysis
- Developmental education and foundations courses
  - Data is NOT suggesting that these course are not successful
  - Data is suggesting that students who place into these courses are not performing as well on this assessment
  - Students taking credit courses may still benefit from dev. ed. pedagogical techniques

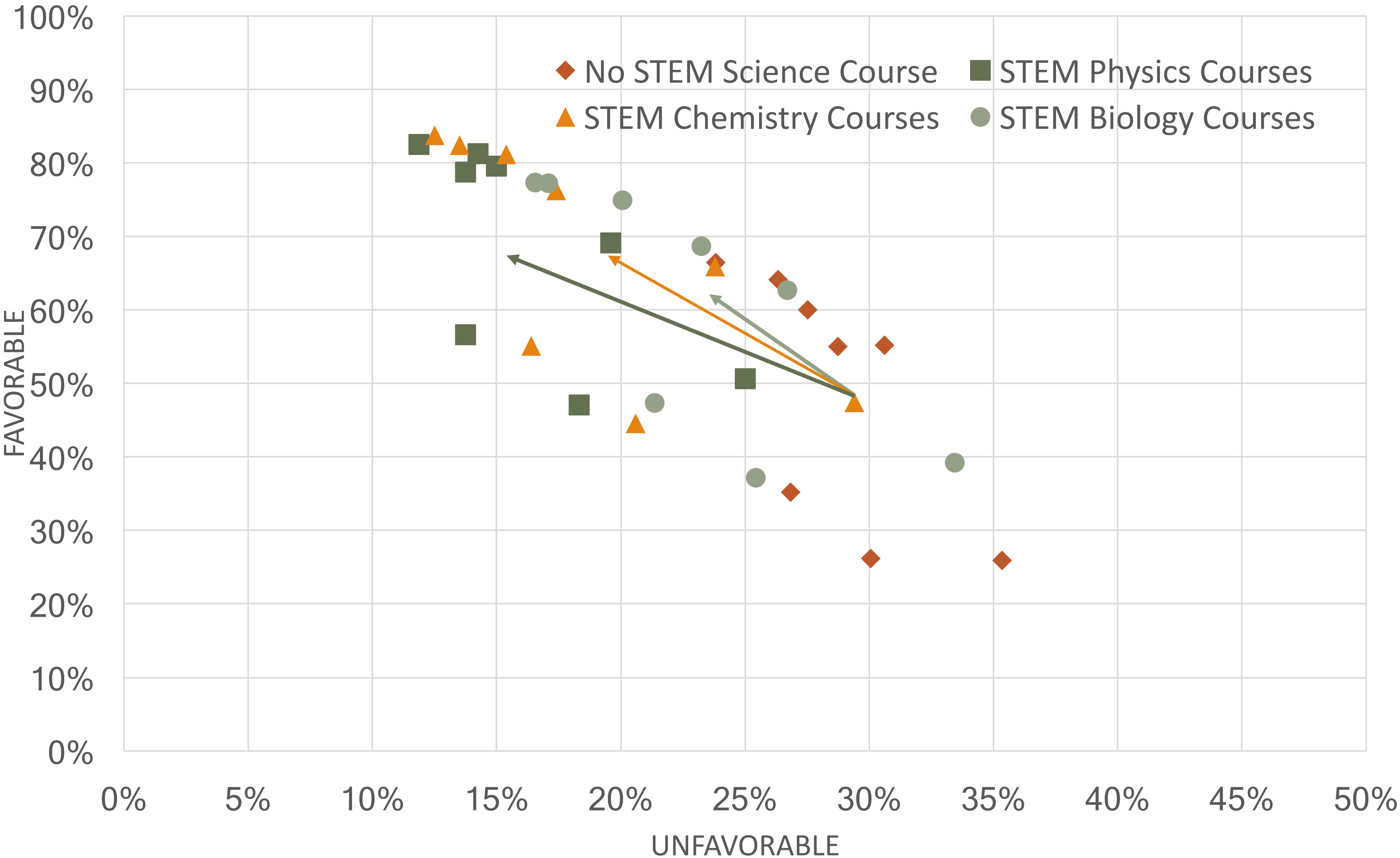
Attitudinal Views of Science

Affective Category	Favorability Mean (-1 to 1)	Spearman's Coefficient
Personal Interest	0.40	0.345
Real World Connection	0.44	0.300
Problem Solving General	0.32	0.372
Problem Solving Confidence	0.43	0.226
Problem Solving Sophistication	0.00	0.292
Sense Making/Effort	0.30	0.273
Conceptual Understanding	-0.09	0.350
Applied Conceptual Understanding	0.02	0.357

ATTITUDINAL SHIFTS



ATTITUDINAL DIFFERENCES



Shifts in Affective Views based on Course History

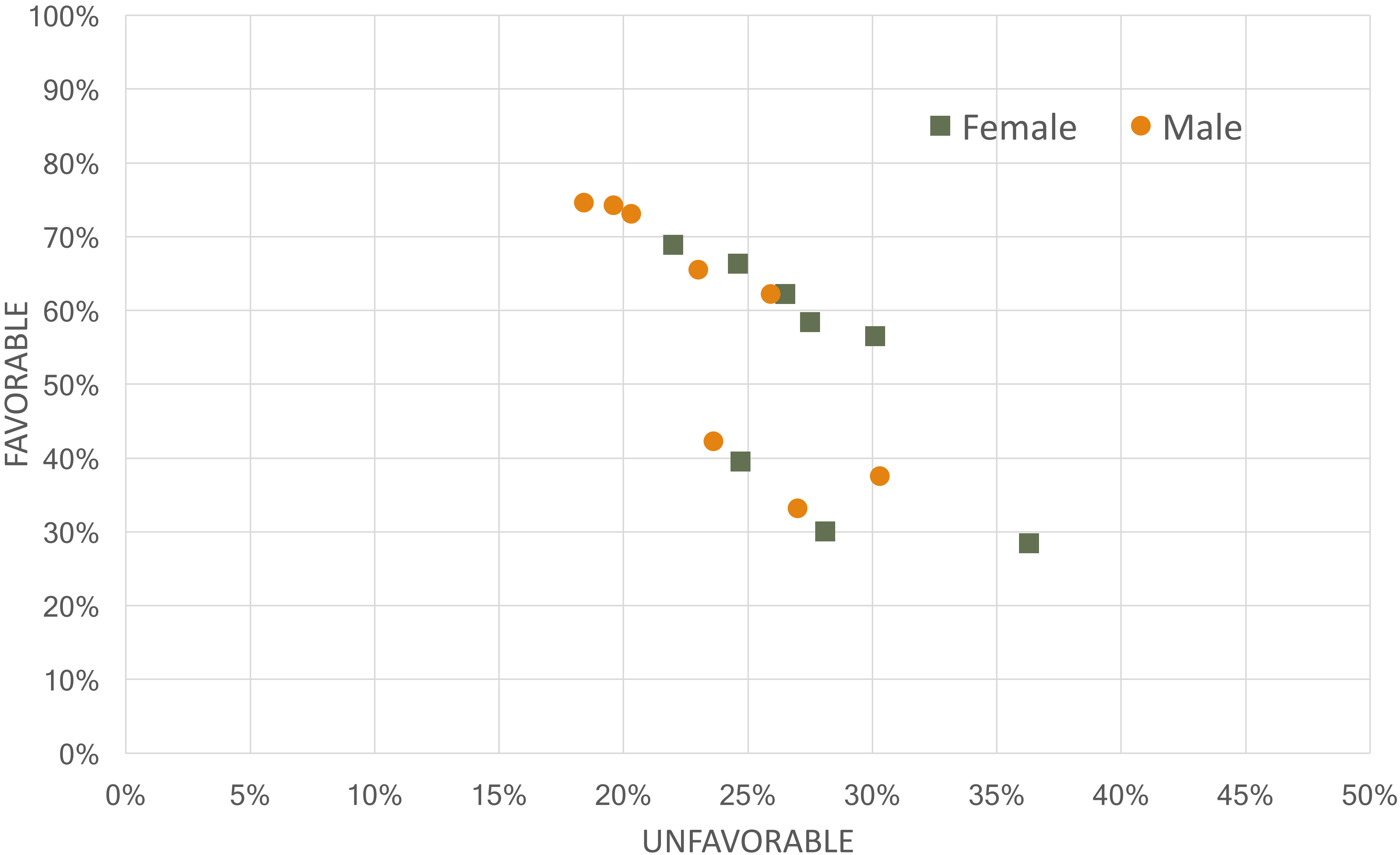
Completion of at least one STEM course shifted affective views to more favorable and less unfavorable

Shifts occurred in all categories examined

Quantification of change will require a weighting scheme applied to courses

- Methods are being explored to calculate these weights

ATTITUDINAL DIFFERENCES



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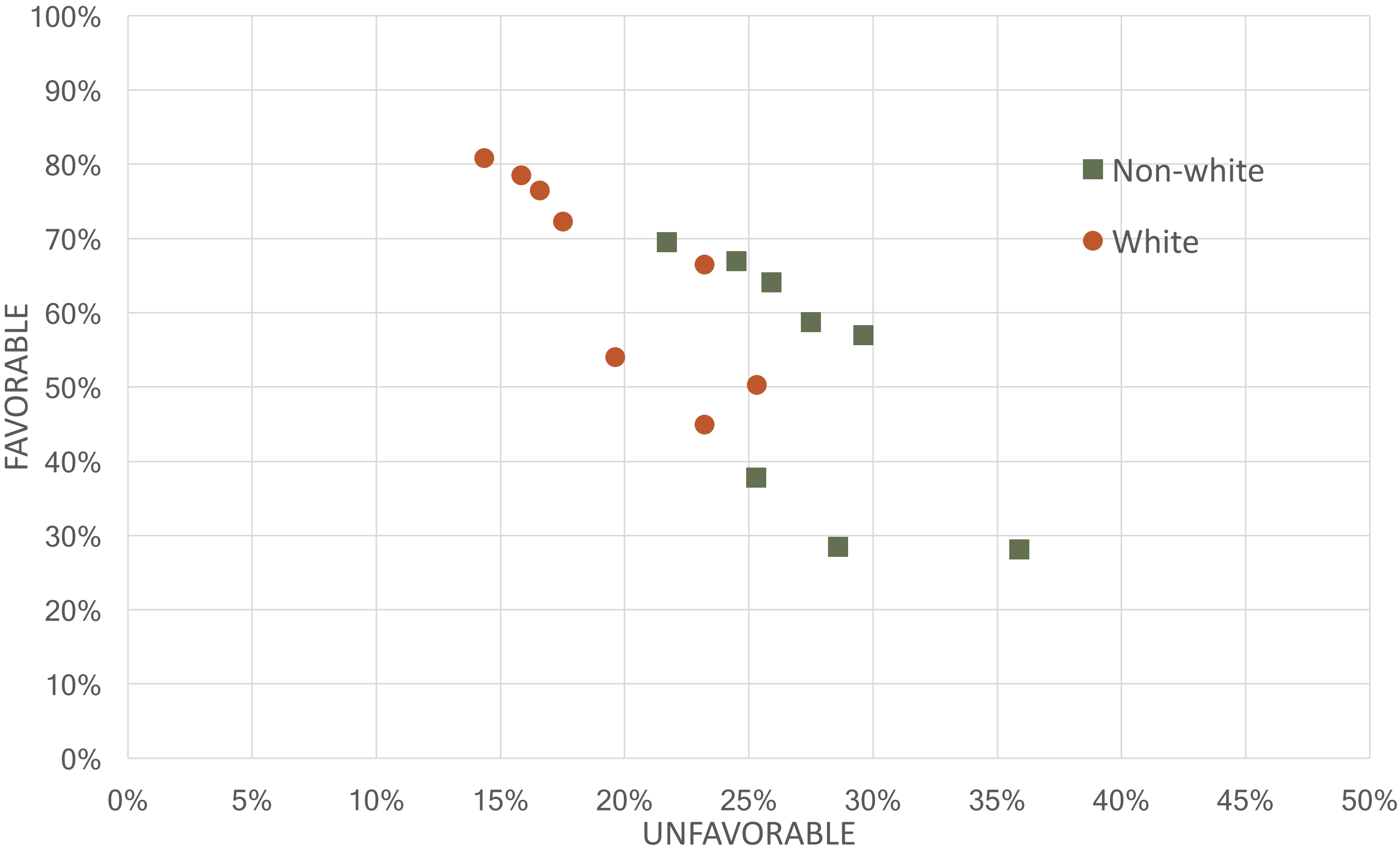

Differences in Affective Views based on Demographics

Average 7% difference in affective views based on gender and 14% based on ethnicity

- Comparable to 4-year university pre-test for general education physical science courses

The National Science Foundation

- Broadening Participation for Greater Diversity

Thank you!

Questions???