Learning Models in STEM

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Abstract

We compared student satisfaction with Learning Communities (LCs) and Mentor Sessions (MSs), both in general and with regard to certain demographics. We find LCs are preferred to MSs and both support underrepresented students.

Goals

We hoped to analyze the effectiveness of different group learning models incorporated at Pomona College and the 5Cs at creating community and quality learning. Throughout our Physics 70 semester equity discussions, we came across a couple of topics that applied heavily to group learning and wanted to see how well LCs could apply that in comparison to MSs. Some topics that we covered in class included: implicit biases, meritocracies, gender bias, microaggressions, structural racism and white privilege. Through these discussions, we arrived at the following motivations for our survey:
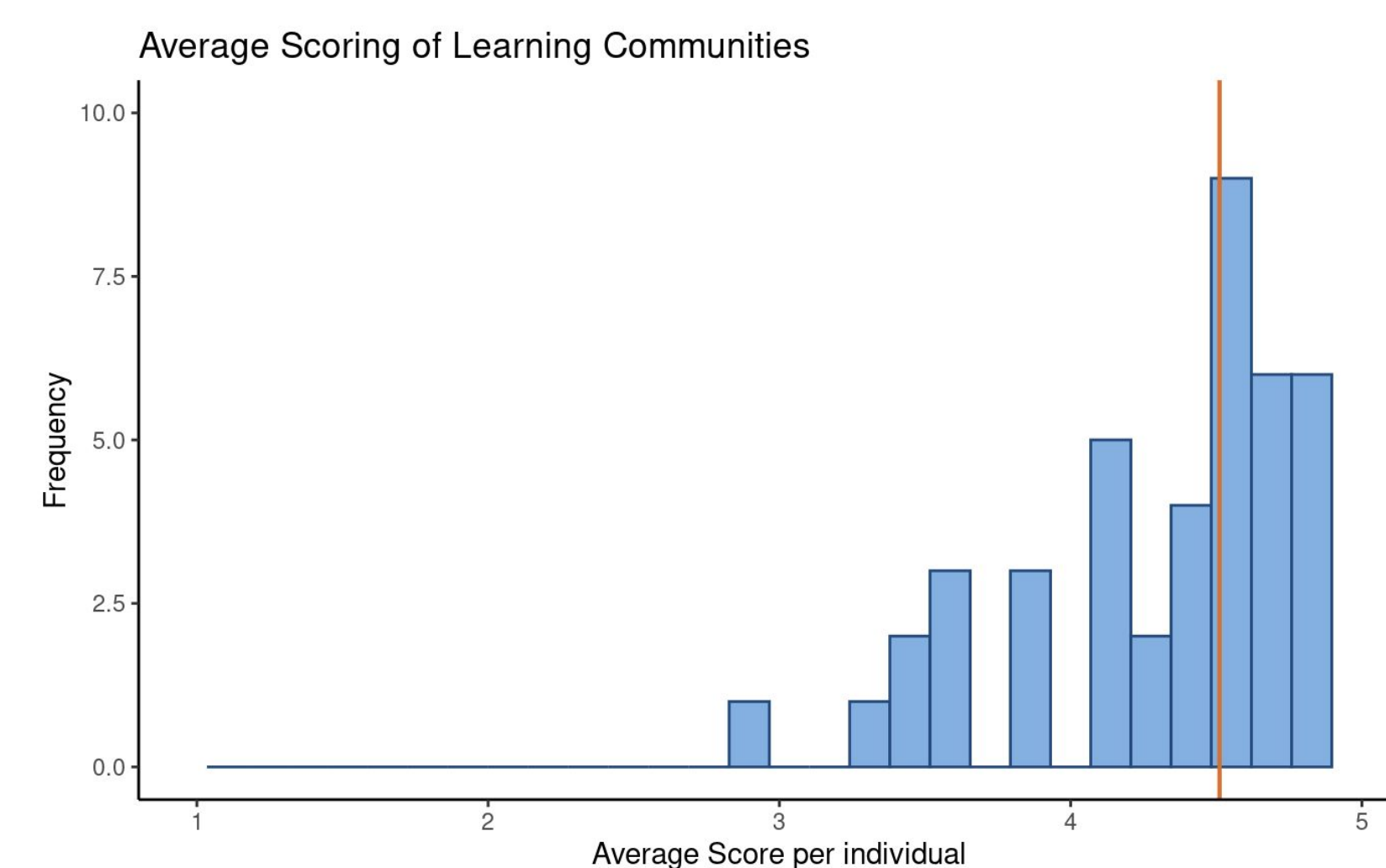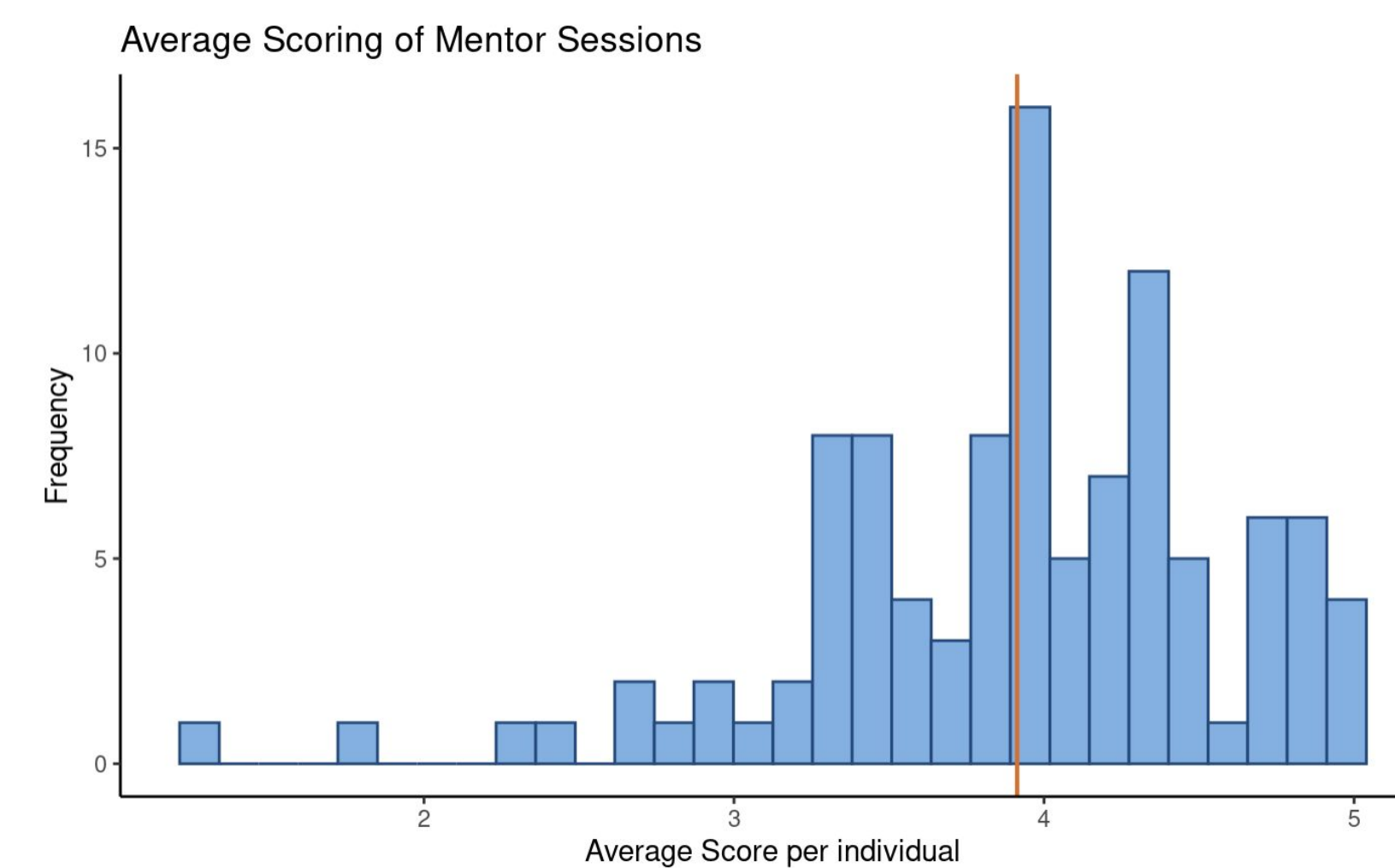
- Are learning communities or mentor sessions better at creating academic communities for students in STEM?
- Are underrepresented students in STEM equitably supported by learning communities and/or mentor sessions?
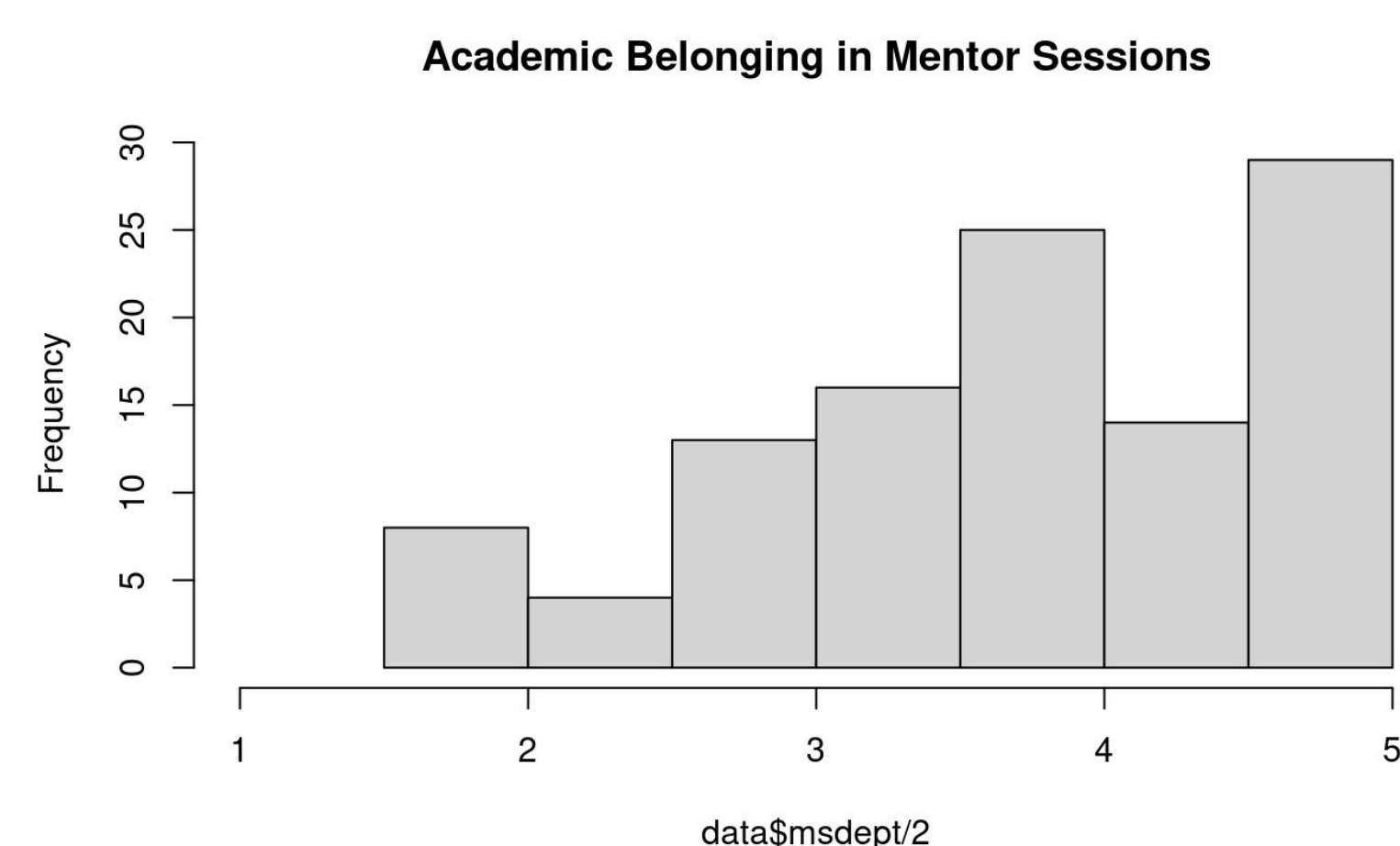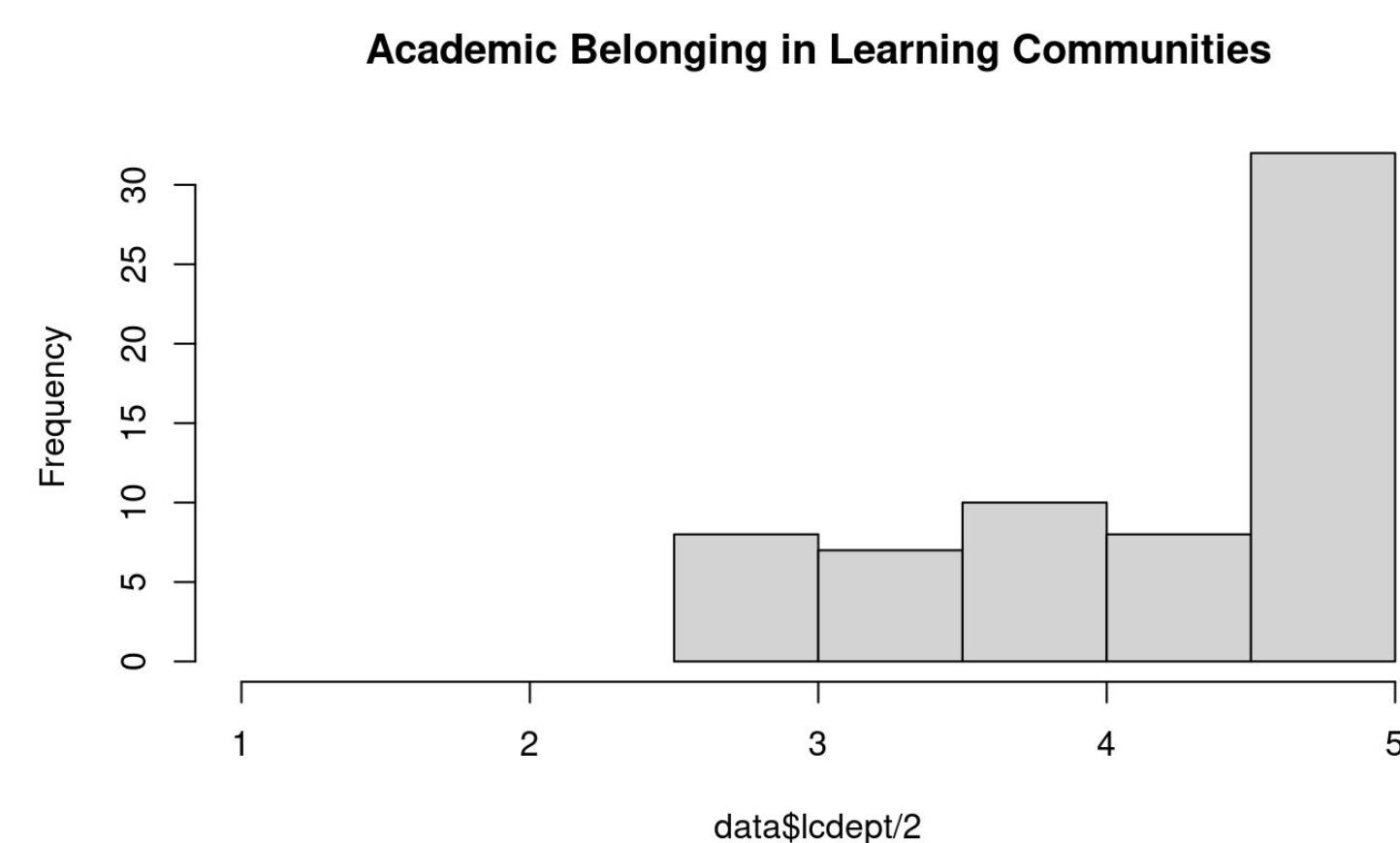
Survey

We created a Google form to gather survey data. We asked respondents the following questions on their experience in MSs or LCs, if applicable. The questions were statements that the respondent would agree/disagree with on a scale of 1-5 (1=Strongly Disagree, 5=Strongly Agree).

- I know the names of everyone in my X sessions.
- I felt comfortable asking questions to my fellow students who came to X sessions.
- I feel comfortable asking questions to the student leading the X session.
- I felt on-pace with the class while working with the people in my X sessions
- I felt supported by the student(s) leading my X sessions.
- I felt supported by the students in my X sessions.
- I felt like I was able to talk about things other than work with the people in my X sessions
- I felt better supported by the department in which my class was held due to X sessions.
- On at least one occasion, I witnessed systemic bias from other students in the X session, to a student other than myself. Can include: microaggressions, non-marginalized students dominating space, assumptions that everyone in the learning community has had the same experiences, etc.
- On at least one occasion, I was the target of systemic bias from students in my X sessions. Can include: microaggressions, non-marginalized students dominating space, assumptions that everyone in the learning community has had the same experiences, etc.

Comparing Learning Models

MSs vs. LCs Overall

Average Scoring of Mentor Sessions

Average Scoring of Learning Communities

`p-value = 0.05514`

We received 127 responses overall, with 109 responses for MSs and 65 for LCs.

These graphs show the average score of each individual by satisfaction. The questions on bias were scaled such that lower scores corresponded to higher satisfaction.

There was an *almost* statistically significant difference between the two via a chi-squared tests, with a p-value shown above. The preference seems to be for LCs over MSs.

MSs vs. LCs: Academic Belonging

Academic Belonging in Learning Communities

Academic Belonging in Mentor Sessions

`p-value = 0.0007571`

However, when observing particularly the questions

- I felt on-pace with the class while working with people in my X sessions
- I felt better supported by the department in which the class was held due to X sessions

There was a statistically significant preference for LCs via a chi-squared test.

We conclude thus that LCs create a better environment for community learning, on the basis of creating a space in which academic pacing is felt to be equal and academic support is distributed through the presence of department-mandated learning communities.

Comparing Community Learning by Demographic

The following demographic information was asked of respondents:

- Interest in STEM (intention to major in a STEM field)
- Race
- Gender (including trans/nonbinary identities)
- First-generation/low-income (FGLI) student or no
- International student or no
- English as first language or no

We conducted paired t-tests of the following groups to examine how effective group learning models at Pomona College are at supporting underrepresented students in STEM.

Interest in STEM: non-STEM students had **lower satisfaction** with STEM group learning than STEM students (p-value = 0.0025)

Underrepresented Races: non-white students not benefited by model minority myths had **higher satisfaction** with group learning (p-value = 0.024)

FGLI: first-generation and/or low-income students had **higher satisfaction** with group learning (p-value = 0.0014)

International and/or ESL: international students and students who do not speak English as their first language had **higher satisfaction** with group learning (p-value = 0.006)

Gender: marginalized genders (i.e., non-cisgender-men) had roughly equivalent satisfaction with group learning as cisgender men. However, their **perceptions of bias** occurring in MSs and LCs was **higher** than that of cisgender men. This reflects discussions had in PHYS070 throughout the semester of gender-based bias in STEM educational settings.

In all cases, no statistical relevance was found on the preference of MSs vs. LCs for underrepresented students. If not stated above, perceptions of bias in MSs/LCs were not found to be statistically significant, which does not mean that they are not an issue, but rather that our data did not present a difference in the perception of bias based on affiliation with that group or not.

Conclusions and Future Directions

Rather than underrepresented communities preferring LCs or MSs, they preferred group learning models overall, and all respondents with regards to academic belonging showed a statistically significant preference towards LCs over MSs. Furthermore, we found gender-based bias was higher than all other forms of bias.

Thus, we endorse the implementation of learning communities on a broader scale (i.e., beyond introductory courses) and the focus on addressing gender-based bias.

References & Acknowledgements