2. STRUCTURING HIGH-QUALITY ONLINE DISCUSSIONS WITH ASSIGNED ROLES

COURSE CONTEXT & DESIGN PROBLEM

Context	Graduate-level Seminar for Engineering Teaching Assistants(Hybrid)
Design Problem	Informal groups led to uneven participation, with some students dominating.
Instructional Solution	Implemented a data-driven group formation strategy using the Louvain community detection algorithm to support balanced, productive groups.
Key Impact	Participation became more evenly distributed. Discussions showed stronger reciprocity and less reliance on a single dominant voice.

IMPLEMENTATION IN THE COURSE

1 Collected early interaction data

Initial seminar discussions and activities to see who responded to whom, and how often

Built an interaction network

2 Applied Louvain community detection

Identified natural clusters in the interaction network

Avoided isolating quieter students at the edges

Balanced more central and less central participants across groups

3 Formed stable discussion/project groups

Used cluster results to assign groups for ongoing seminar tasks

Ensured each group had a mix of voices and experience levels

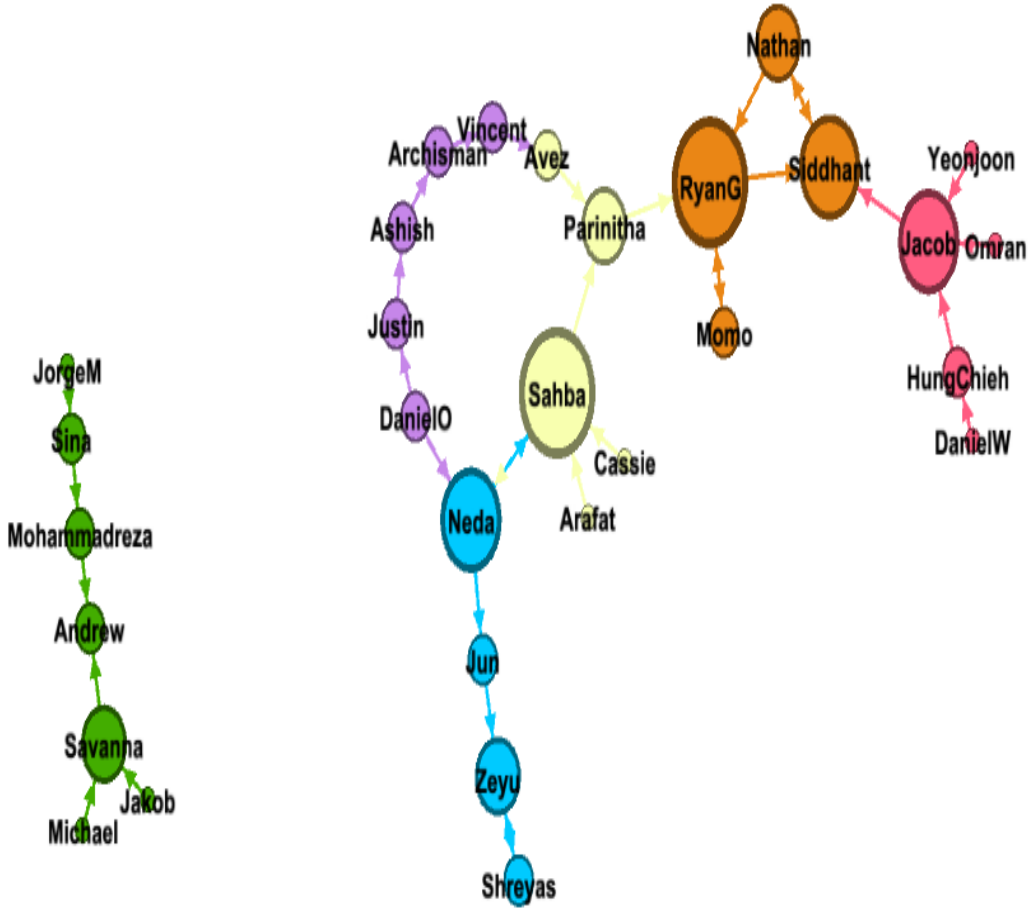
Reduced the risk of one person "carrying" the group

4 Integrated into course flow

Announced final group assignments early in the semester

Groups stayed together for discussions, peer feedback, and mini-projects

Monitored collaboration patterns over time


Nathan
Vincent
Archisman
Avez
RyanG
Siddhant
Yeonjoon
Ashish
Parinitha
Jacob
Omran
Justin
Momo
HungChieh
Sahba
DanielO
Cassie
DanielW
Neda
Arafat
Jun
Zeyu
Shreyas
JorgeM
Sina
Mohammadreza
Andrew
Savanna
Jakob
Michael

IMPACTS &REFINEMENTS

Observed Outcomes

- Group assignment lists informed by network data
- Before/after network views of group structure
- Brief instructor notes on how to use data-informed grouping in future offerings
- Participation became more evenly distributed across group members.
- Discussions showed stronger reciprocity, reducing reliance on a single dominant voice.
- Group work on teaching cases and activities was smoother and more sustained.
- Groups felt fair and purpose-driven rather than arbitrary.
- Less time was spent addressing group issues and reassignments.

Design Reflection & Iteration

- Combine network-based grouping with brief preference data (e.g., teaching interests, prior experience).
- Add a short orientation explaining why structured groups matter for their development as future instructors.
- Provide simple visual feedback to TAs about how their group is participating over time.
- Provided a **repeatable, data-informed grouping method** for future cohorts.

https://doi.org/10.1186/s41239-024-00495-w