

# Exploring Classroom Collaboration with Social Network Analysis



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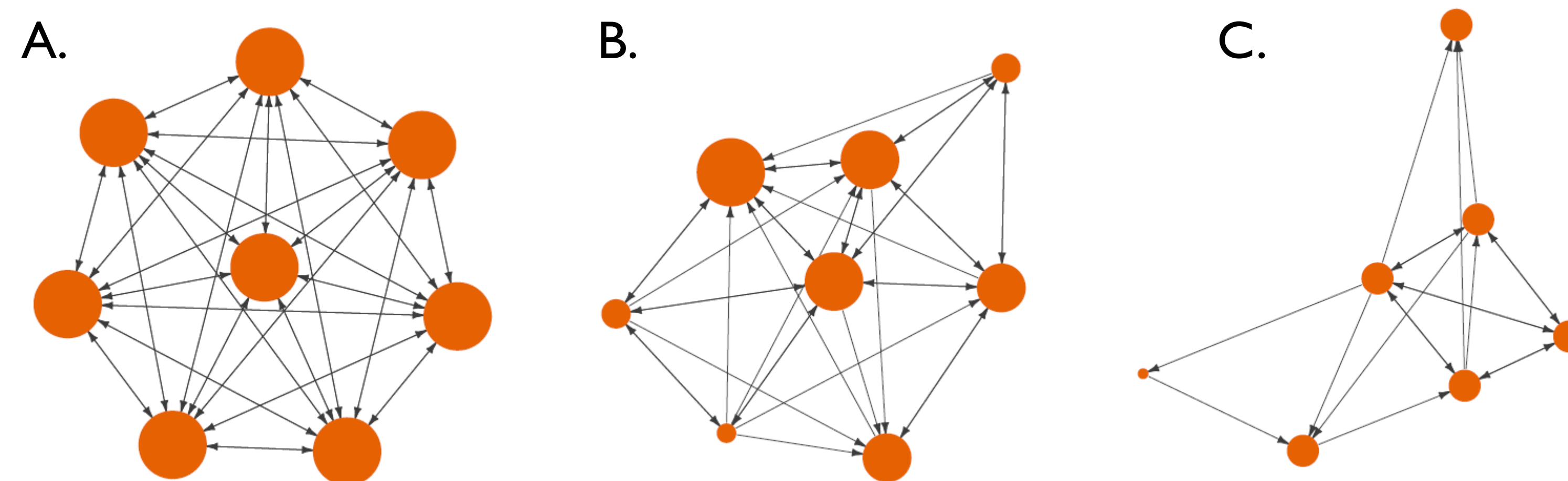


## Understanding Intragroup Dynamics is Essential

- Many studies have documented collaborative learning as having a significant positive effect on the academic performance of college students in STEM classes [1, 2, 3].
- SCALE-UP classrooms, containing fifteen round tables seating nine students each, are designed to facilitate collaboration in the classroom [4].
- However, intragroup dynamics and relationships can give rise to individualistic efforts, exclusion, student frustrations, and other factors that decrease the degree of collaboration achieved by the group.
- Understanding how individuals within a group interact is therefore essential to evaluating the success of the SCALE-UP classrooms.
- Social network analysis may be able to give such insight into intragroup relationships.

## The Social Networks Were Largely Decentralized with Varying Densities

Representative examples from our data



### Average Network Characteristics ± SD (Min-Max)

- Density:  $0.58 \pm 0.21$  (0.30-0.88)
- Centralization:  $0.23 \pm 0.10$  (0.06-0.40)
- Reciprocity:  $0.66 \pm 0.15$  (0.46-0.91)

## Students Described Interactions Using Broad, General Terms

Themes that Describe Individual Interactions      % of Written Responses

*This student interacts with me by....*

• Being involved in discussion	23%
• Helping with group work	20%
• Helping with group quizzes	15%
• Answering my questions	13%
• Solving problems	10%
• Talking with me	7%
• Asking me questions	6%
• Checking answers with me	2%
• Other	5%

## Research Questions

1. To what extent can one apply social network analysis to investigate intragroup relationships in the classroom?
2. To what extent do students in a SCALE-UP classroom actively collaborate with the individuals at their table?

## Methodology

### 1. Self-Reported Surveys in BIOL 151

Name	Interaction? Yes/No	Describe your interactions
Student 1		
Student 2		

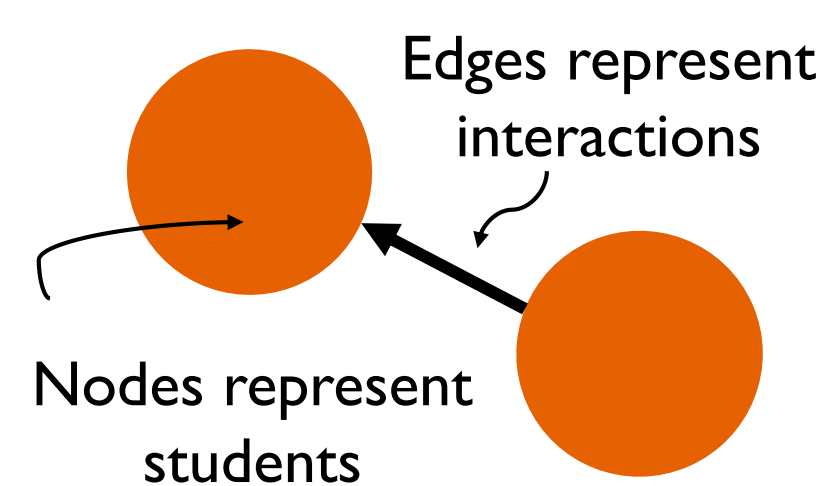
Surveys were given four times throughout the semester. Interaction information was used to make social networks.

#### Course Context

- **Content:** Flow and storage of information in biological system
- **Student Population:** Science Majors (pre-health/ag); mostly freshmen and sophomores

- **Class Size:** 135

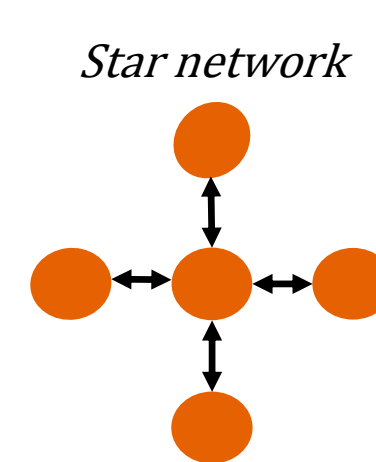
### 2. Social Networks Map Interactions



*Centralization:* On a scale from 0 to 1, how close is the graph to a star network?

*Degree:* Representative of number of personal interactions

- *In-Degree:* Who listed you, (scaled 0-1)
- *Out-Degree:* Who you listed (scaled 0-1)

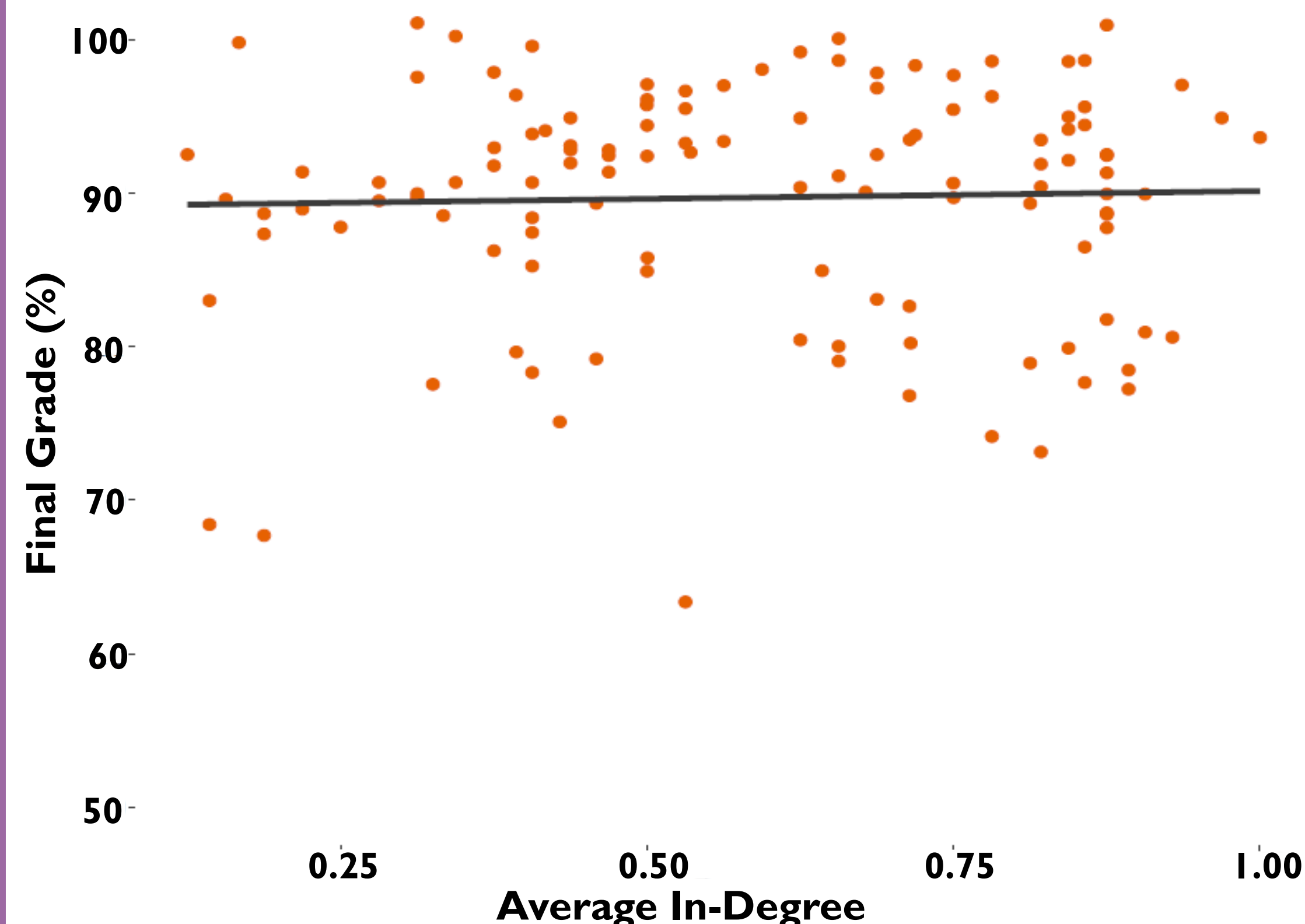


$$\text{Density} = \frac{\text{Actual Connections}}{\text{Potential Connections}}$$

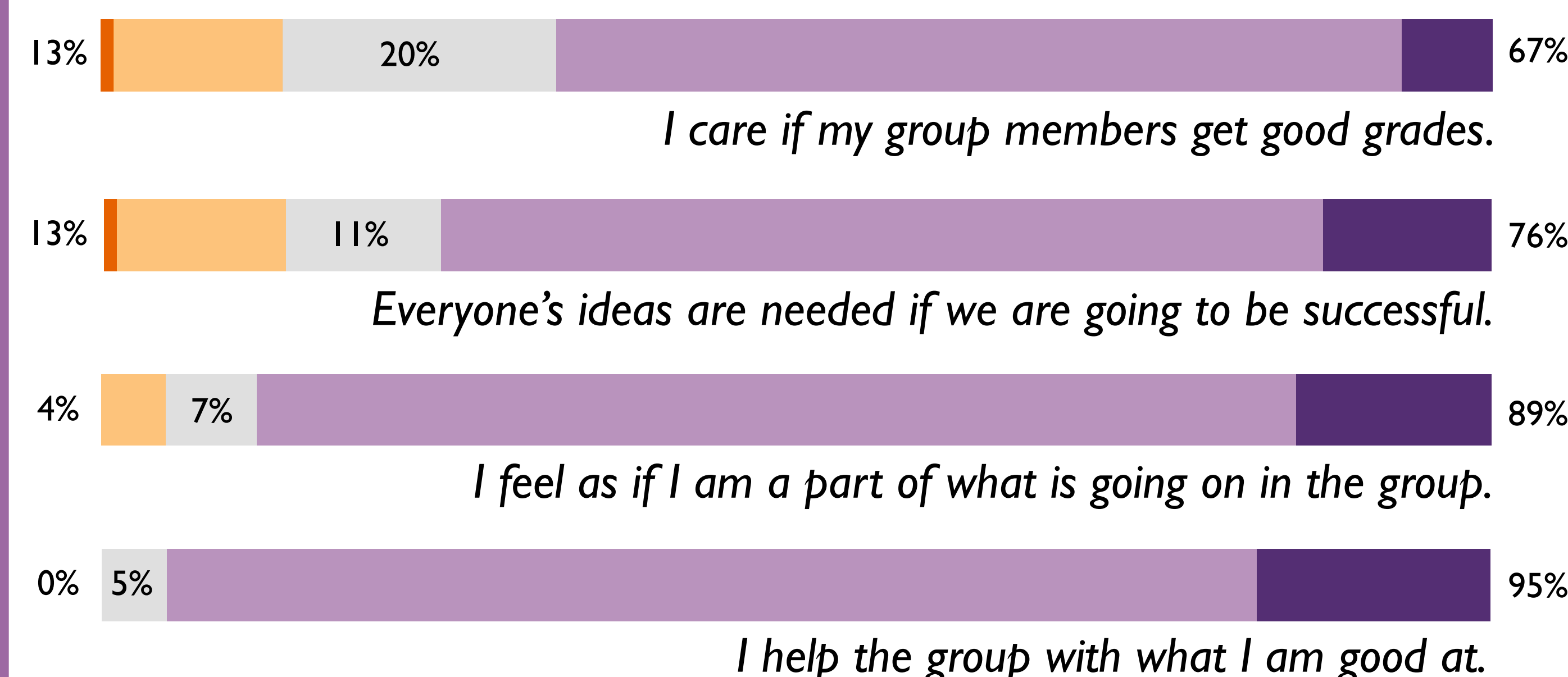
### 3. Thematic Analysis of Written Responses

### 4. Analysis of Likert Survey on Group Perceptions

## No Relationship Between Final Grade and In-Degree



## Student Perceptions Illustrated High Interdependence



#### Key

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

\*Percentages on the far left represent those who strongly disagree or disagree, percentages in the center are those who are undecided, and percentages on the right represent those who strongly or agree.

## SCALE-UP Students Demonstrated Affinity Towards High Levels of Inclusive Collaboration

- Social networks were dense and decentralized, indicating students form multiple relationships and members were perceived as equals.
- Inclusive discussions and group activities characterized many relationships.
- Students were not ostracized for performing poorly in the class.
- Many students believed themselves to be interdependent on each other and had positive views of collaborative learning.

## References

- [1] D.W. Johnson, R.T. Johnson and K.A. Smith, "Cooperative Learning: Improving University Instruction by Basing Practice on Validated Theory," *Journal on Excellence in University Teaching*, vol. 25, no. 3&4, pp. 85-114, 2014.
- [2] N. Armstrong, S.-M. Chang and J.M. Brickman, "Cooperative Learning in Industrial-sized Biology Classes," *CBE Life Science Education*, vol. 6, no. 2, pp. 163-171, 2007.
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- [4] R.J. Beichner, "The SCALE-UP Project: A Student-Centered Active Learning Environment for Undergraduate Programs," 2008.

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