

The Effect of Group Gender Composition on Student Participation and Learning in Undergraduate Engineering Project Teams

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Abstract

Female students are outnumbered by male students in the UM College of Engineering, despite being well represented among the total undergraduate population. In 2009 and 2010, the incoming class in engineering was 23% female, consistent with national trends and reflective of gender stereotypes depicting engineering as a “male” domain. Because there are fewer female than male engineering students, the composition of small groups of students, including those assigned to complete class projects, is likely to be skewed in favor of men. In this study, we draw on research findings from psychology on the influence of gender stereotypes and skewed gender compositions on women working in male-dominated fields as well as education research on self-efficacy and active participation to investigate the effect of being in the gender minority in a small class project group. We address the question:

Can being in the gender minority have a detrimental effect on learning and motivation for female engineering students?



Figure 1. Sample screen shot of student group presentation.

Study Setting

In Engineering 100: Introduction to Engineering students are assigned to 4 to 6 person teams to complete a semester-long introductory engineering design project. Project teams are created based on several variables including gender, race/ethnicity, living location and skill sets. Overall teams are often skewed in favor of men, with a variety of team gender compositions within any given section.

At the end of each semester, teams are required to deliver a final oral presentation. This research project explored the possibility that in mixed gender teams, female students would more often present less technical material, while male students would more often present more technical material.

Research Methodology

There were two primary components to this research investigation:

- A systematic investigation of the roles adopted by male and female students as a function of gender composition of the presentation group in videotaped presentations
- A questionnaire administered to a subset of students immediately following delivery of their final oral presentations to assess student self-perceptions

Team Composition	Teams on Video	Women on Video	Women on Video w/ Survey	Women w/ Survey Only	Men on Video	Men on Video w/ Survey	Men w/ Survey Only
All Women	3	12	4	0	0	0	0
Sole Men	11	41	3	3	11	1	1
Majority Women	18	48	0	0	32	0	0
Even	37	81	6	0	81	8	0
Majority Men	44	57	14	3	85	19	2
Sole Women	29	29	12	2	106	40	5
All Men	33	0	0	0	77	58	41
Total	175	268	39	8	392	126	49

Table 1. Team and gender composition of videotaped presentation and survey respondents.

Study Variables

A preliminary analysis of this data set was performed using the following measures:

Dependent measures:

- Number of technical or non-technical slides each student presented
- Speaking time ratio (actual time/expected time)
- Number of questions answered by each student
- Leadership and effective speaker ratings assessed by two independent judges

Predictor variables:

- Student gender
- Group gender composition (male dominated, equal split, female-dominated)

Acknowledgements

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Results

Data were analyzed using a 2(student gender) X 3(group gender composition: male dominated, equal split, female dominated) ANOVA

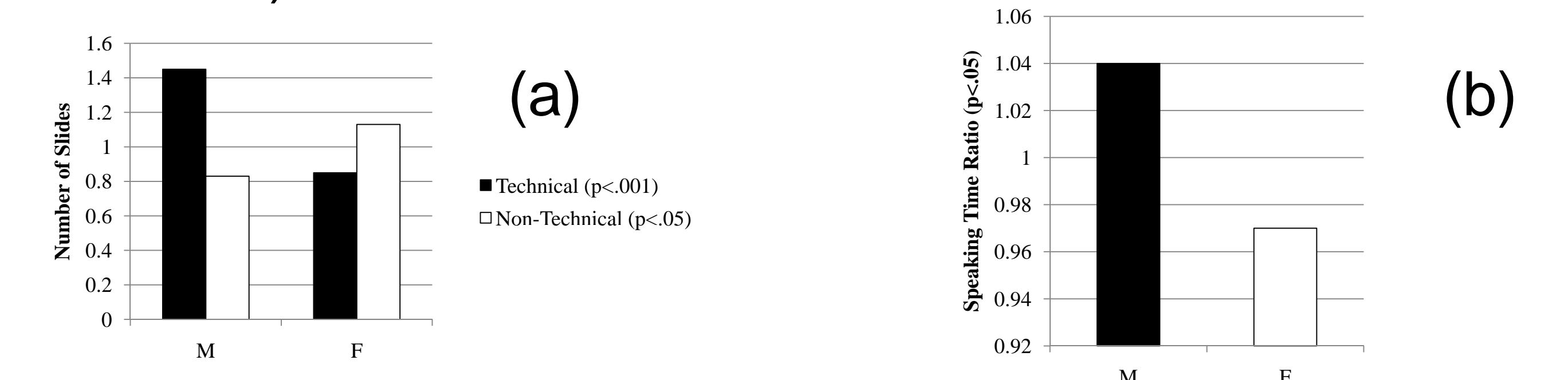


Figure 2. Men presented more technical information (a) and spoke for a longer than expected period of time (b), whereas women presented more non-technical material (a) and spoke for a shorter than expected period of time (b), regardless of the group gender composition.

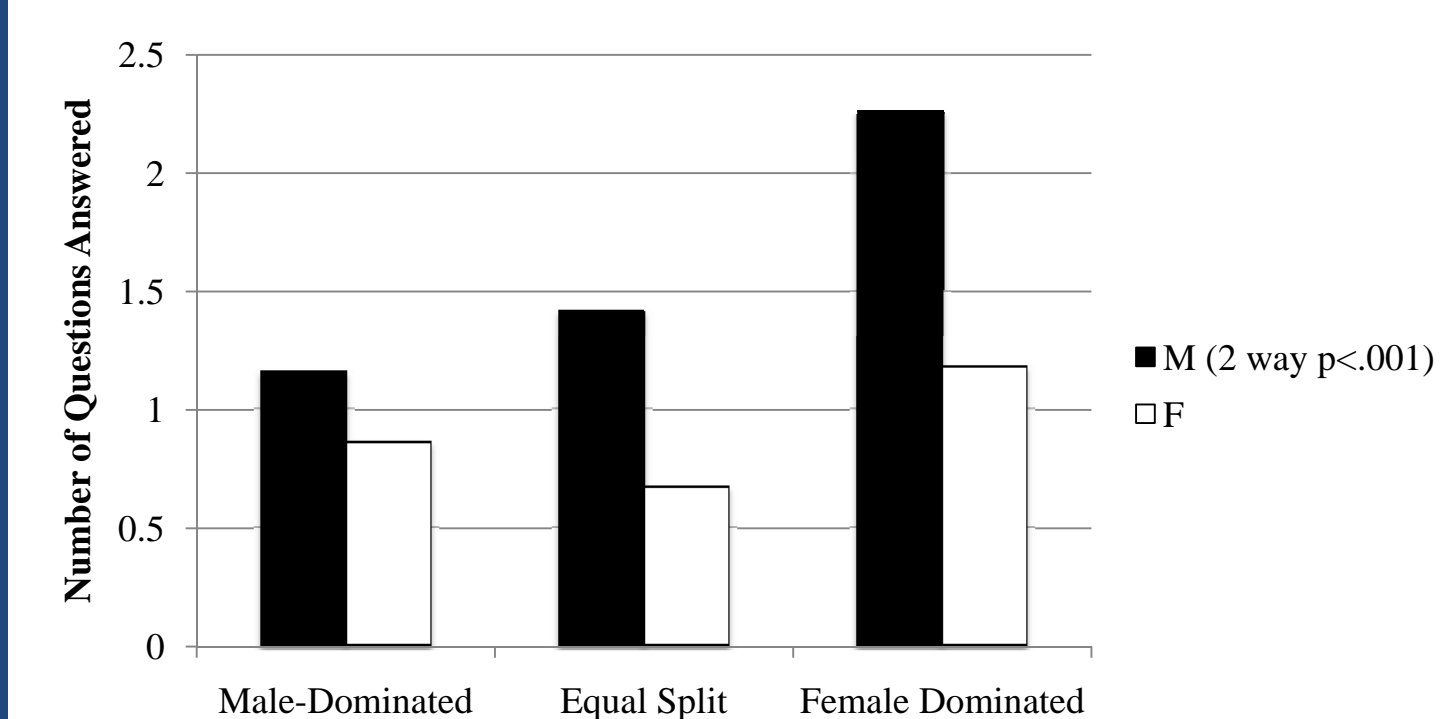


Figure 3. Men fielded more questions about their group presentation than women particularly in female dominated groups.

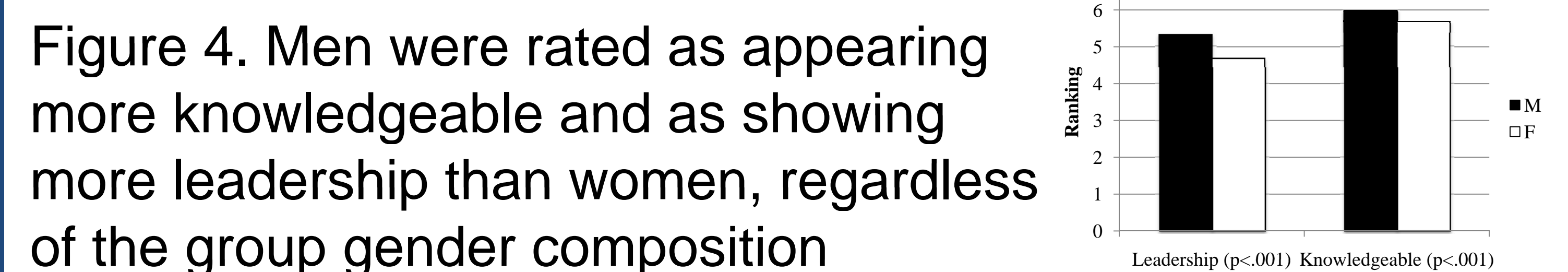


Figure 4. Men were rated as appearing more knowledgeable and as showing more leadership than women, regardless of the group gender composition

Based on survey responses, both men and women tended to rate themselves as having performed well in female dominated groups: men thought they did well when there were few other men present, and women thought they did well when there were many other women present.

Conclusions

Results suggest that women are more likely to adopt passive, supporting roles, and men to adopt active roles in group presentations. Therefore, men may be more likely to “learn by teaching others”. By disproportionately missing the opportunity to explain the technical aspects of the project to an audience, women students may be at a disadvantage both in terms of their technical understanding and their perceptions of self-efficacy in engineering. Results also showed that women rated their own performance higher when in groups with more women, consistent with work showing that women tend to under-perform when in all-male groups.