

Confidence in Learning Statistics with R Programming Language

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Motivation and Background

- IEMS 303 is a required introductory course to the foundations of statistics for industrial engineering students
- It is pre-requisite for IEMS 304 (data analysis course) which requires R
- This quarter I introduced two lab practicals to encourage the 29 students (26 Undergrad + 3 Grad) to learn R

Research Questions (RQ)

- **RQ 1:** Is there any increase in confidence in using R from beginning to the ending of the course?
- **RQ 2:** Is there any difference between the rated confidence in using R and the exam performance?
- **RQ 3:** How can we use exams as reflective tool?

Literature Review

- Use of technology promotes active learning in statistics [1]
- Computers can be programmed to provide immediate feedback on student performance in many ways [2]
- The various examination schemes provide educators insight into students’ competence, but little is known about students’ ability to self-assess their proficiency [3]

Data Collection

- Software usage survey (Pre-class)
- Confidence survey (Pre-Exam & Post-Exam)

Pre-Exam Survey Question Sample:

Using a scale of 1 = Not at all, to 5 = Extremely, please rate how confident you are in your ability to use R for the following topics:

☐ Analyze descriptive statistics

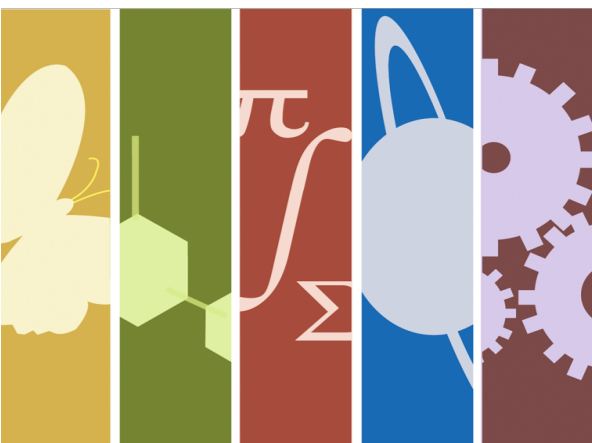
Post-Exam Survey Question Sample:

Based on your exam, what areas do you need to work on? Select all that apply.

☐ Analyze descriptive statistics

References

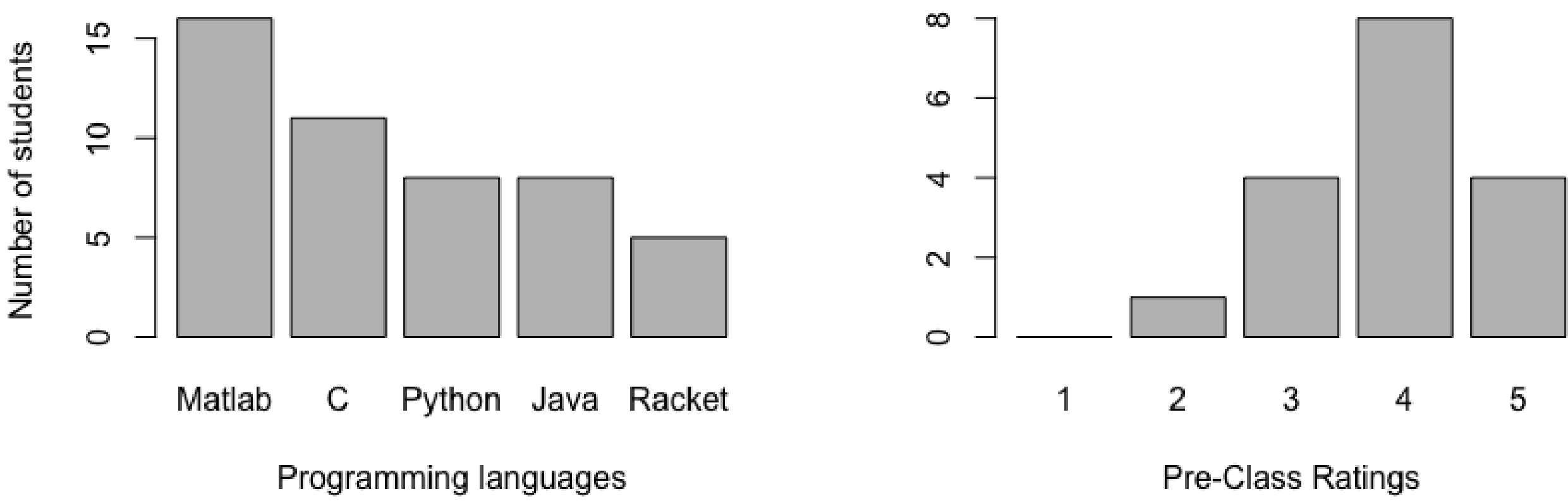
[1] Spinelli, Michael A. "The Use of Technology in Teaching Business Statistics." Journal of Education for Business, 2001.
[2] Katz, L., Linton, L., Poorten B., "Current and Potential Uses of Technology in the Teaching of Statistics", Proceedings of the International Conference on Education and Technology, 2006.
[3] Matthews, N., Nattestad, A., Falk-Nilsson, E. and Alstam, R. "The interactive examination: assessing students' self-assessment ability." Medical Education, 2004.



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RQ 1: Confidence Before IEMS 303

- Except 1 student, none of the students has previous experience in R
- All students have previous experience using any additional programming language



RQ 2: Comparison of Exam Performance and Rated Confidence

- 3 main areas are determined for comparison
- After the exam, the question is asked to see if they need to work on those areas
 - Area 1: 6 YES/ 19 NO
 - Area 2: 19 YES/ 6 NO
 - Area 3: 13 YES/ 12 NO
- For each area, percentage of the points lost is calculated in the exam

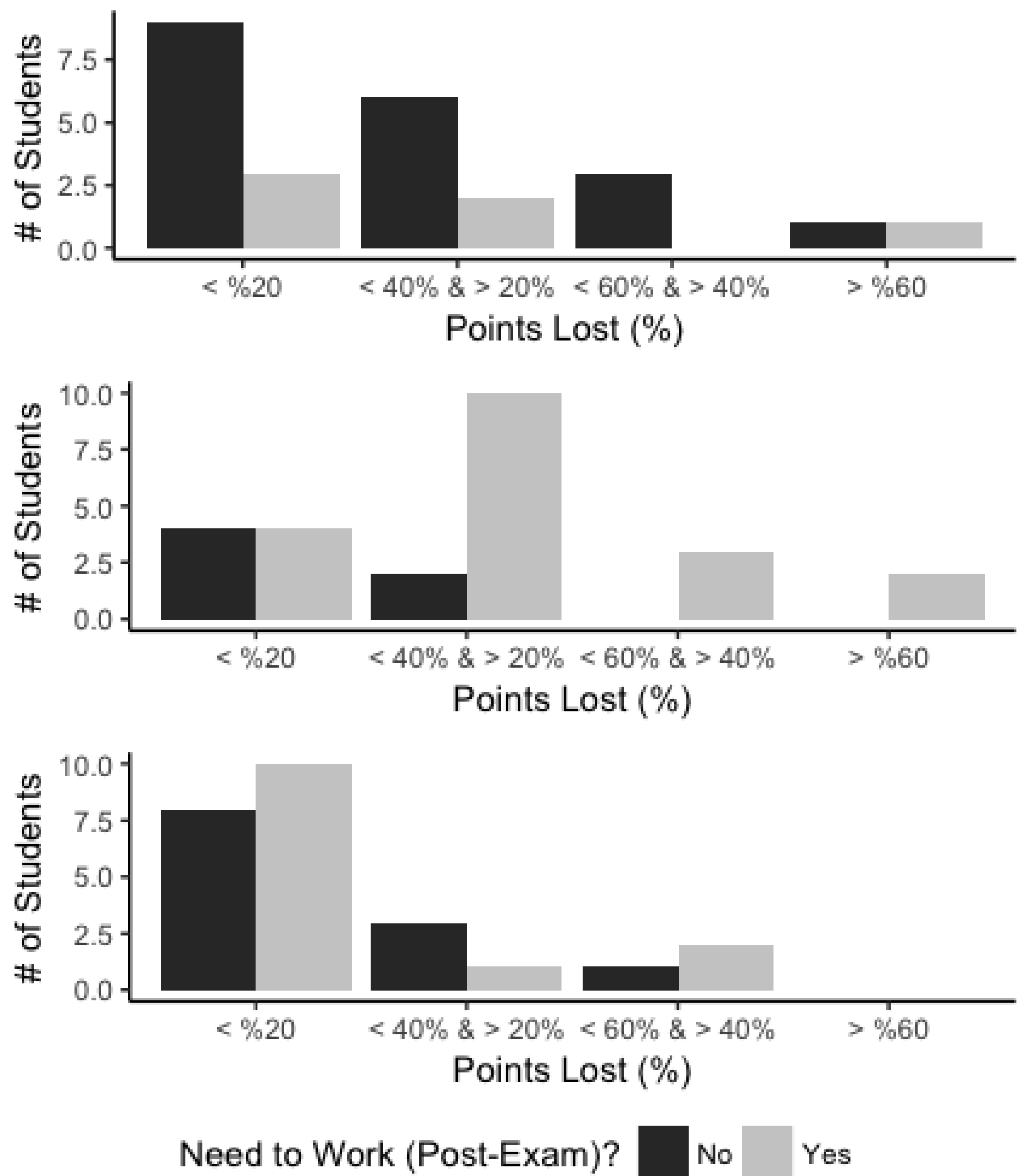


Figure 1: Post-Exam Survey & Exam Performance Comparison

RQ 3: Exams As a Reflective Tool

- Pre-exam: Rate your confidence in 6 areas
- Post-exam: Do you need to work on those areas?
 - Area 1: 4 YES/ 21 NO; Area 2: 6 YES/ 19 NO
 - Area 3: 19 YES/ 6 NO; Area 4: 8 YES/ 17 NO
 - Area 5: 3 YES/ 22 NO; Area 6:13 YES/ 12 NO

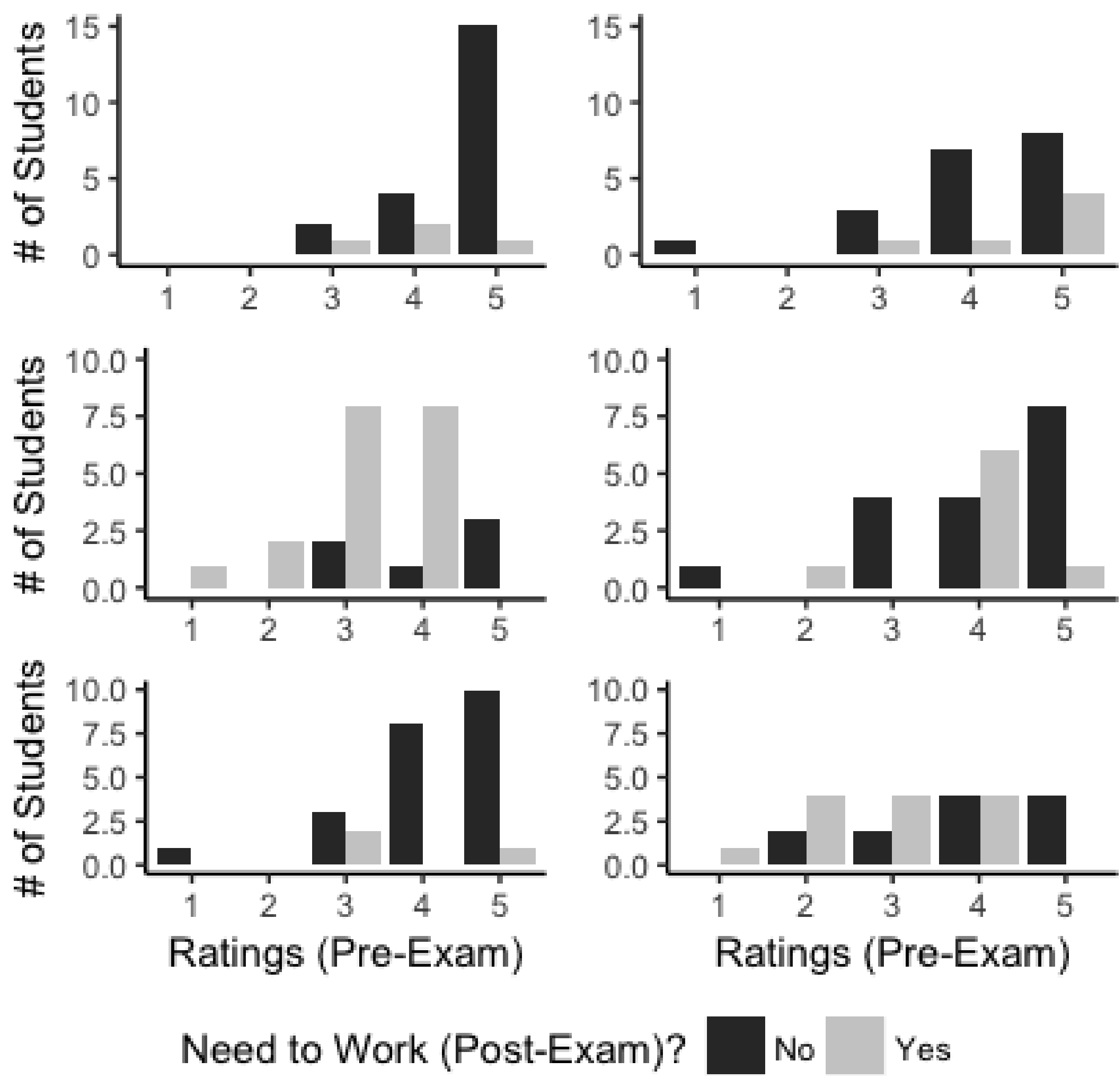


Figure 2: Pre- & Post-Exam Survey Comparison

Reflections/Conclusions

- Students were feeling confident before IEMS 303
- Area 1: Very confident (post-exam) & performed OK
- Area 2: Not confident (post-exam) & performed OK
- Area 3: Confident (post-exam) & performed well
- Area 1 & 5: Very confident (pre-exam) & No need to work (post-exam)
- Area 2 & 4: Confident (pre-exam) & No need to work (post-exam)
- Area 3 & 6: Not confident (pre-exam) & Need to work (post-exam)