Contextualizing Gendered Patterns of Performance in Introduction to Engineering (ENGIN 100)

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Project Goals

In his 2013 "Learning Analytics at UM" talk, available at **www.crlt.umich.edu/slam**, Tim McKay discussed results from his large-scale data analyses, including grade penalties/bumps and gender performance disparities for large courses at UM. (See Figure 1 for McKay's graph depicting this data.) Because we regularly co-teach a section of one of these "large courses," Engineering 100 (circled in red on the graph), we wanted to better understand the narrative told by McKay's graph, and how our course fits into it.

We examined micro-data (overall performance information from various sections of ENGIN 100, as well as more specific performance information such as students' patterns of CTools use), in order to provide further detail about the data point represented by ENGIN 100.

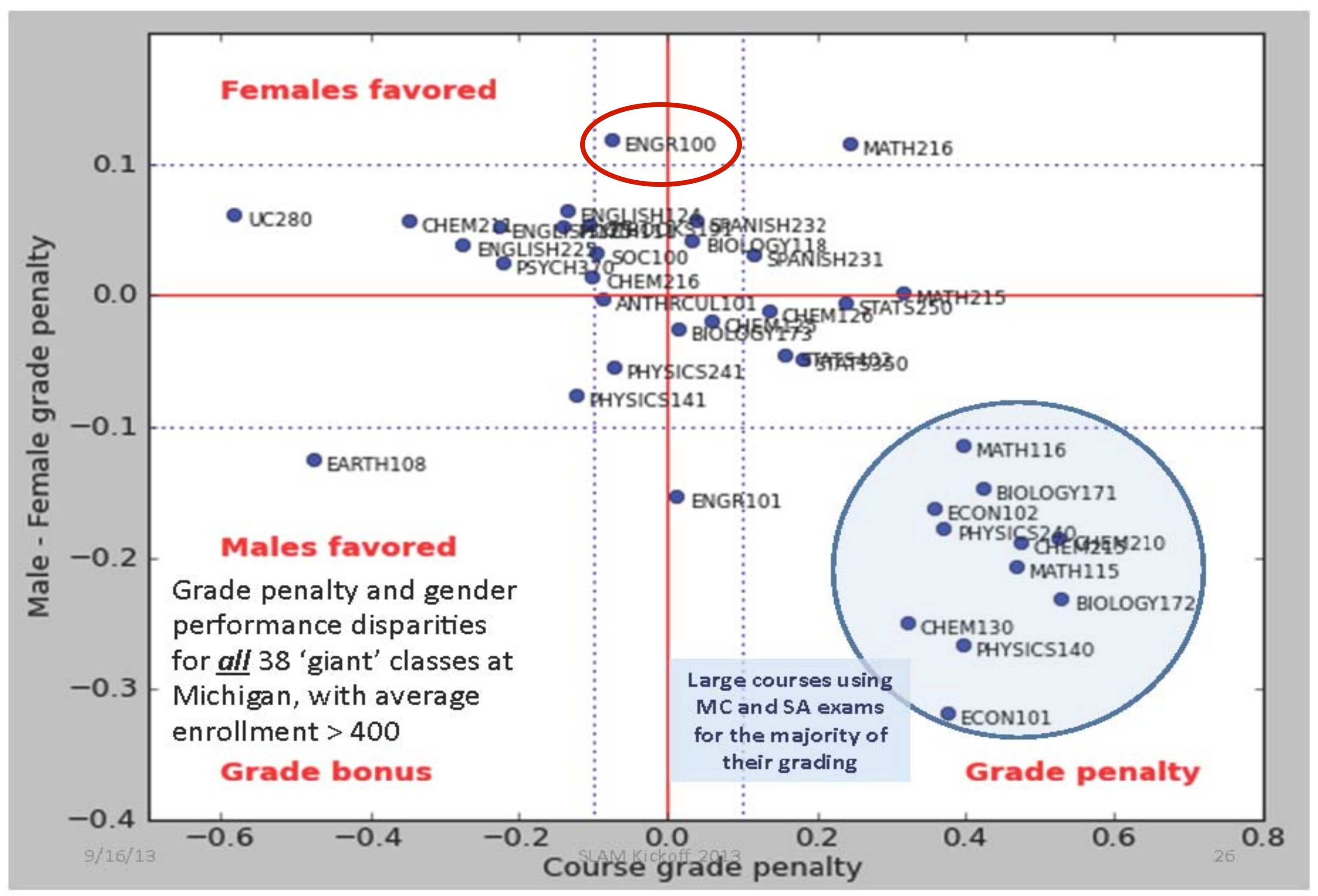

Figure 1. Grade penalties/bumps and gender performance disparities for large courses at UM, with Engineering 100 circled in red. That specific course has a grade "bump" (students receive scores that are on average almost 0.1 grade points above GPA. It also has a gender performance disparity, where the average grade earned by female students is slightly more than 0.1 grade points above the average earned by male students. **(Source: McKay, 2013)**

Background

"Introduction to Engineering" at UM is a project-based, team-based course. Students can select from the roughly 10 differently-themed sections of ENGIN 100 offered each semester. Each section of the course is team-taught by technical and technical communication faculty, and 30-50% of a student's grade is based on communication work. Students work in teams to design (and often build and test) something, and then they communicate about their design through both oral and written reports.

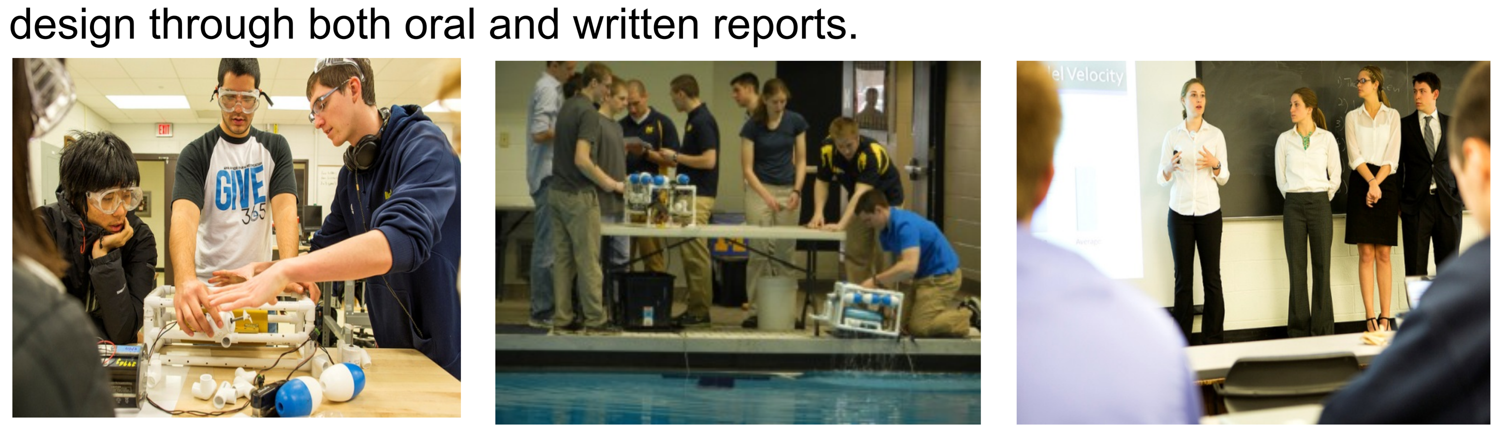

Figure 2. Students in Engin 100-600 working on their remote-operated vehicle projects. From left to right: Designing/building, testing, and communicating about design. Photo credit: Joseph Xu.

Data Analysis

We analyzed data about student performance in ENGIN 100 (final grade earned in the course), student performance in the first year (GPA, calculated without ENGIN 100), and demographic information to calculate grade penalty/bump and male-female grade difference for the 98 sections of ENGIN 100 taught between Fall 2007 and Winter 2012.

Results: Individual-Level

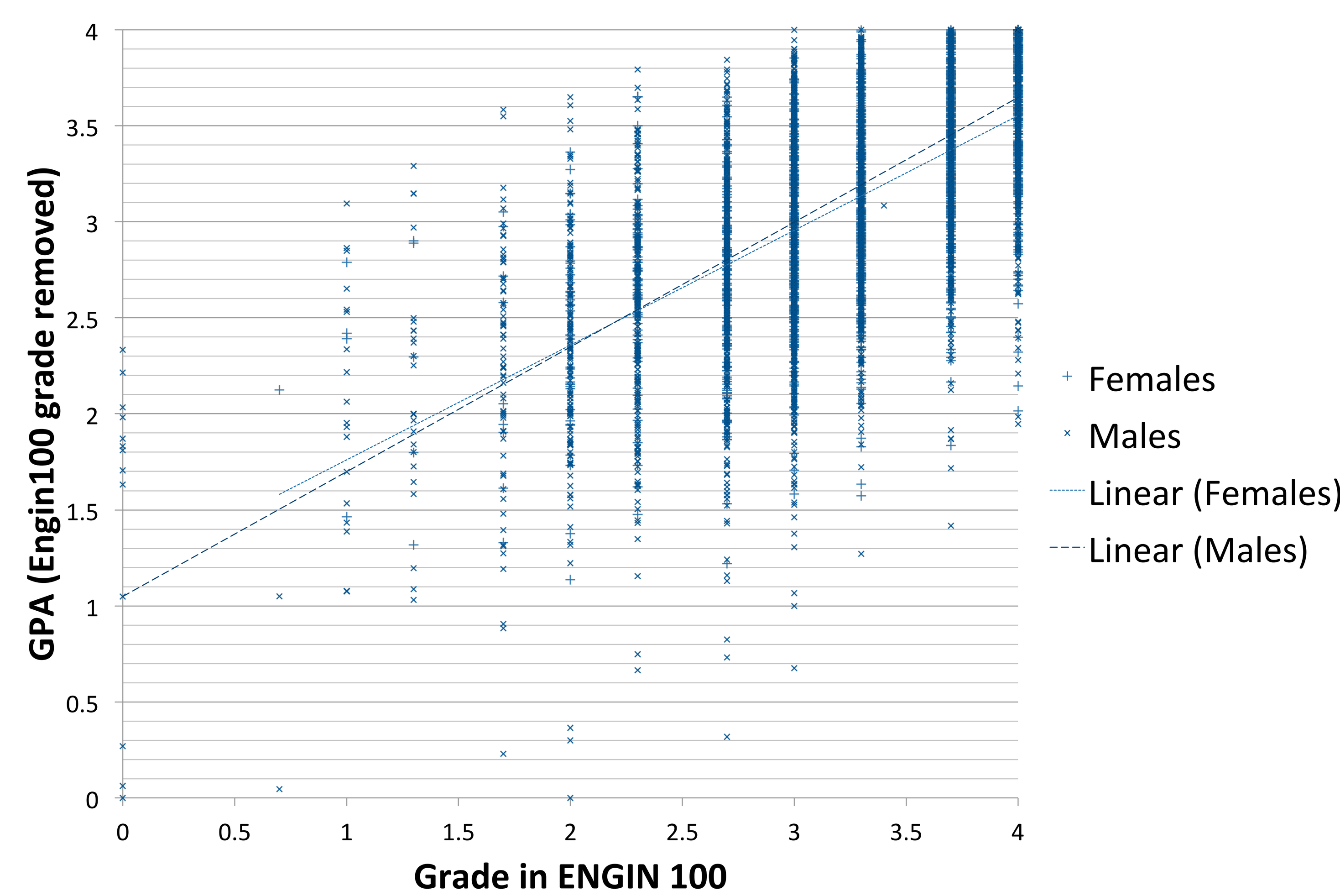

Figure 3. This graph demonstrates that there is a lot of scatter in ENGIN 100 final grades. The lines of best fit show the positive relationships between GPA and course grade. A t-test of overall grade by gender shows a statistically significant but moderate difference (female students score higher than male students in this course).

Results: Section-Level

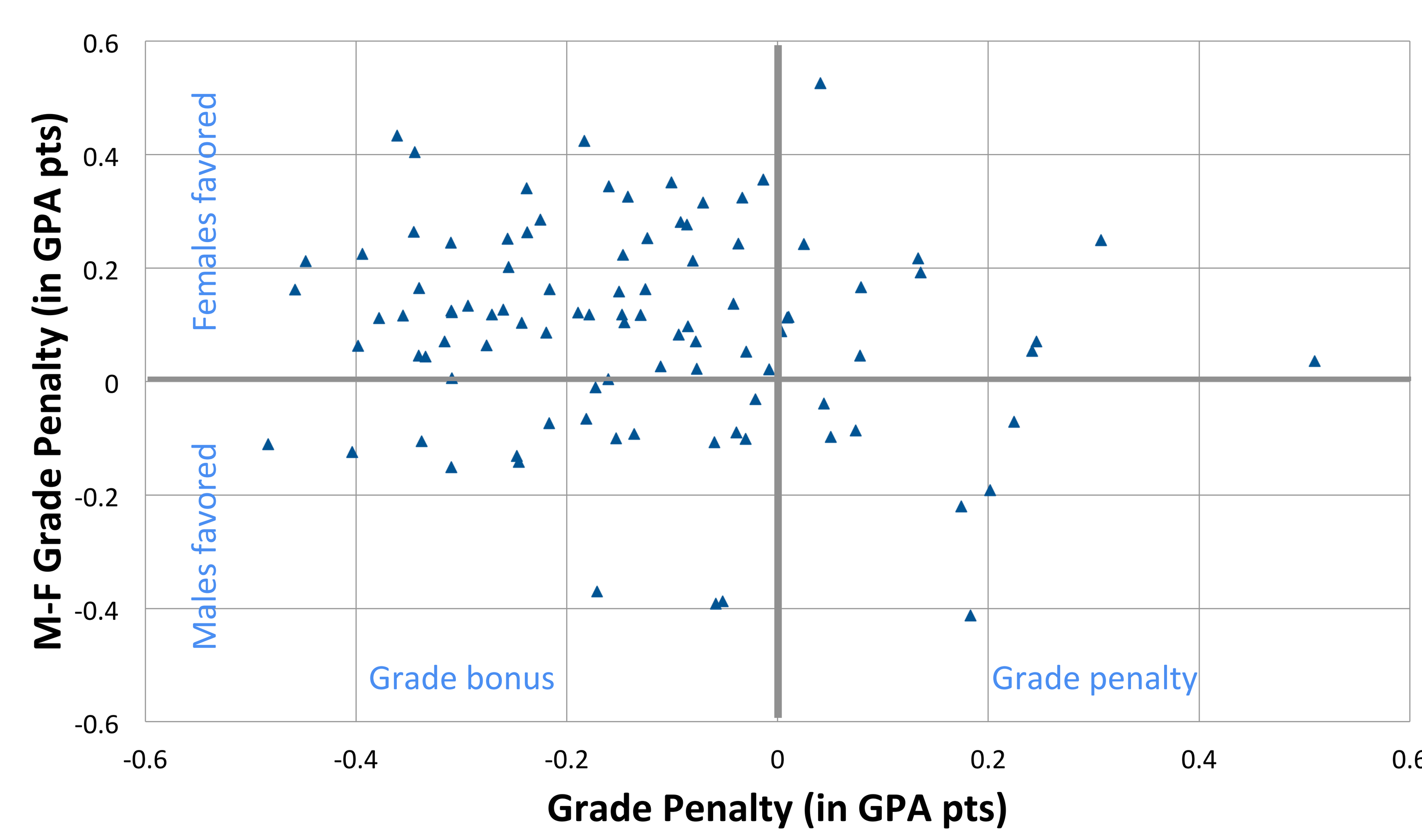

Figure 4. A section-level analysis shows a lot of scatter, as well; however, some of the scatter along the Y-axis is disproportionally affected by the regularly small number of female students in some sections. (We chose not to omit this data from our analysis because doing so would have resulted in systematically omitting data from specific sections of ENGIN 100 in which enrollment by women is low.)

Results: Section-Level (continued)

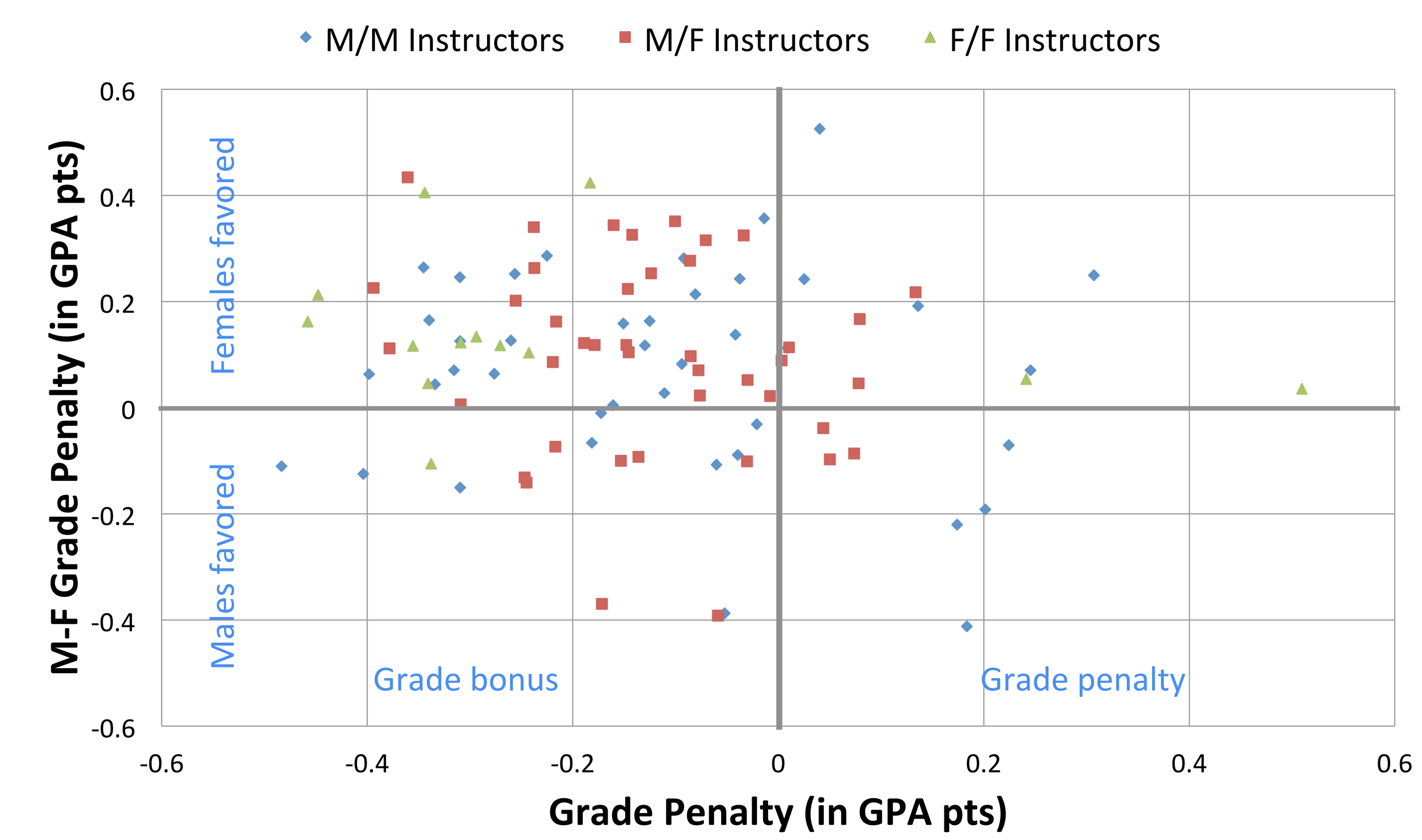

Figure 5. This chart shows a breakdown of the ENGIN 100 section-level results based on the gender of the two lead faculty. One limitation of this analysis is that it only captures information on the communication and technical "leads," and not the other instructional faculty in the different sections, which can include discussion leaders, IAs, and lab managers. (This information was not readily available.)

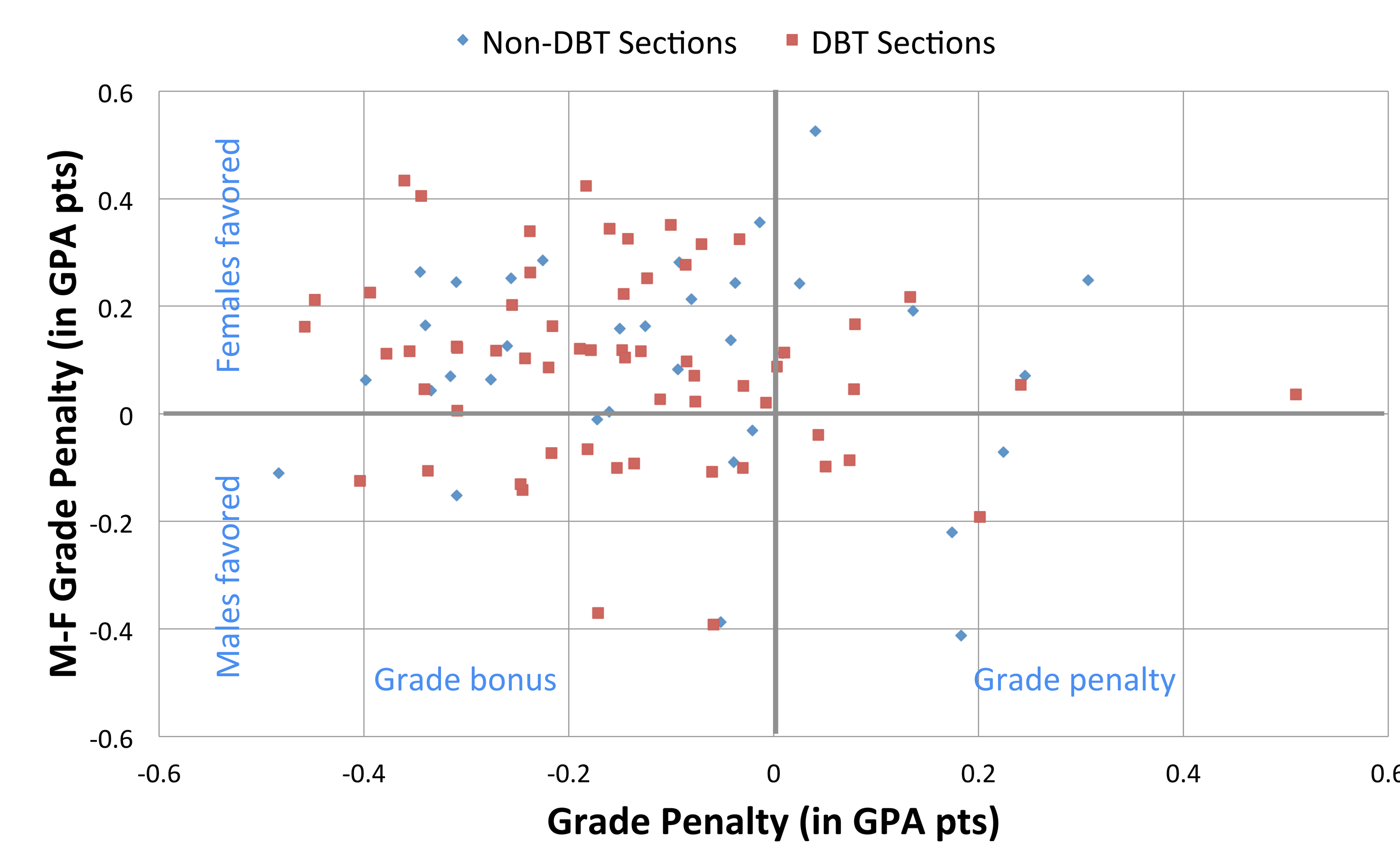

Figure 6. This chart displays the ENGIN 100 section-level results while differentiating between sections designated as "Design, Build, Test" (DBT) and those that aren't. It should be noted that DBT designation was determined by administrators, and there is some overlap in terms of the level of building/testing in various DBT and non-DBT sections.

Conclusions and Next Steps

Using the data reported on here, as well as a richer data set (e.g., more detailed student CTools use patterns, exam scores, ACT/SAT scores, team contribution scores), we hope to further investigate what factors predict success in Engin 100 and beyond. This success may conceivably be measured by course grade, grade bump/penalty, future performance in engineering/retention in engineering, or a combination of some or all of these.

Acknowledgments

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