

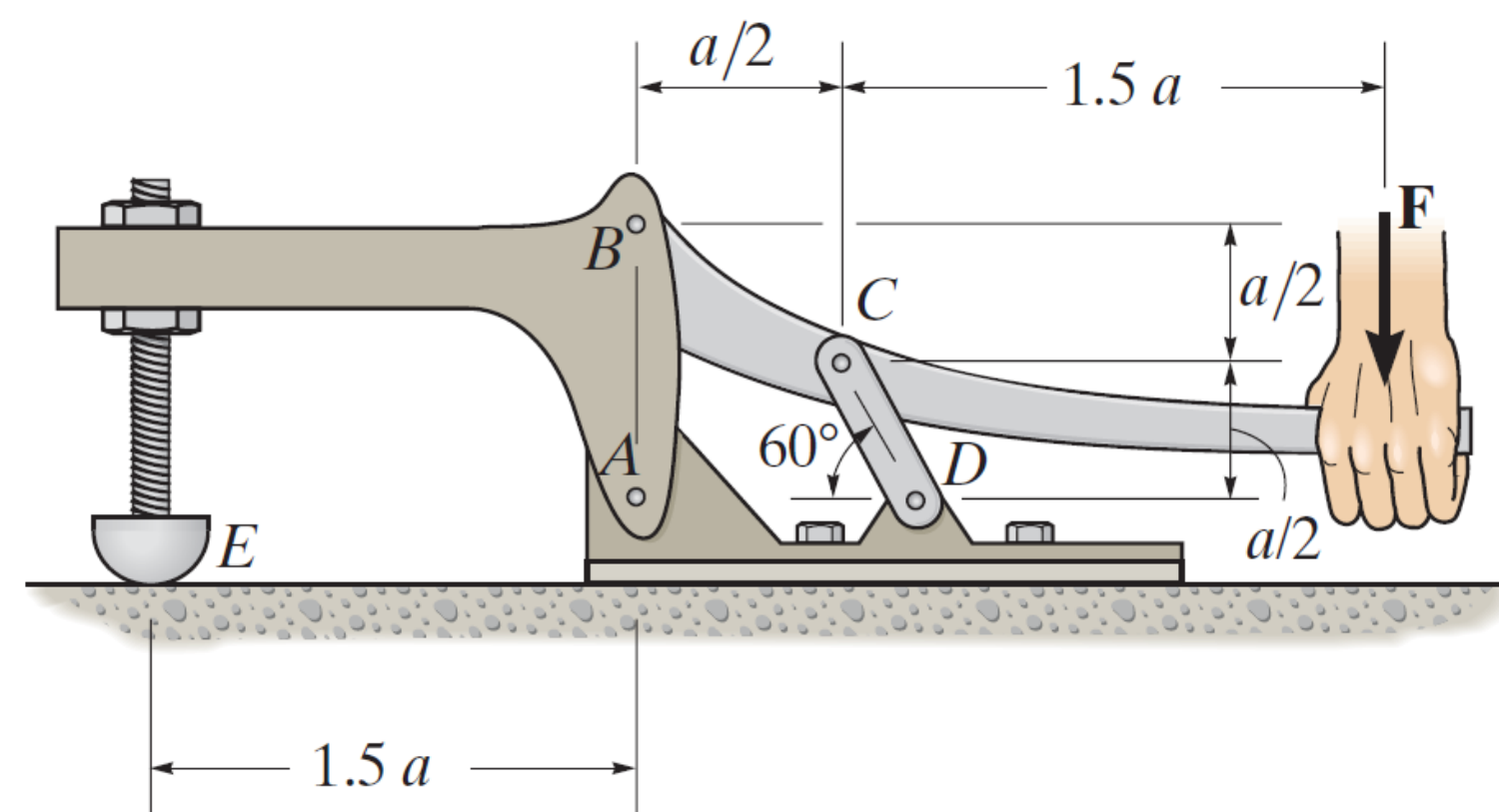
The Effectiveness of Hands-On Demonstrations on Understanding Statics Principles

Jesus Pena, Mechanical Engineering
 Mentor: Dr. Jay Oswald, Associate Professor
 School for Engineering of Matter, Transport and Energy

Research Objective

Create a real model of a problem showing statics principles to understand the effectiveness of Hands-On demonstration on Engineering sophomores.

*6-80. The toggle clamp is subjected to a force F at the handle. Determine the vertical clamping force acting at E .



Background

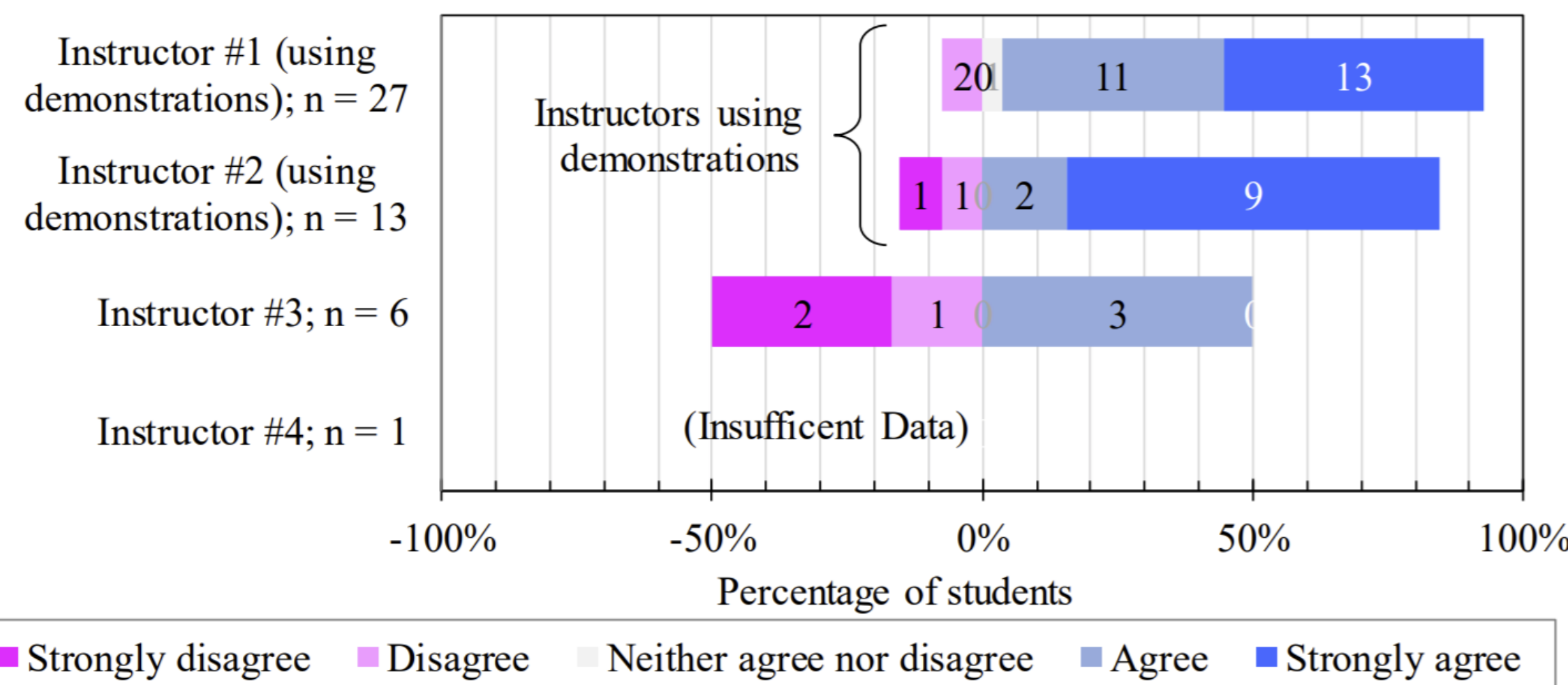


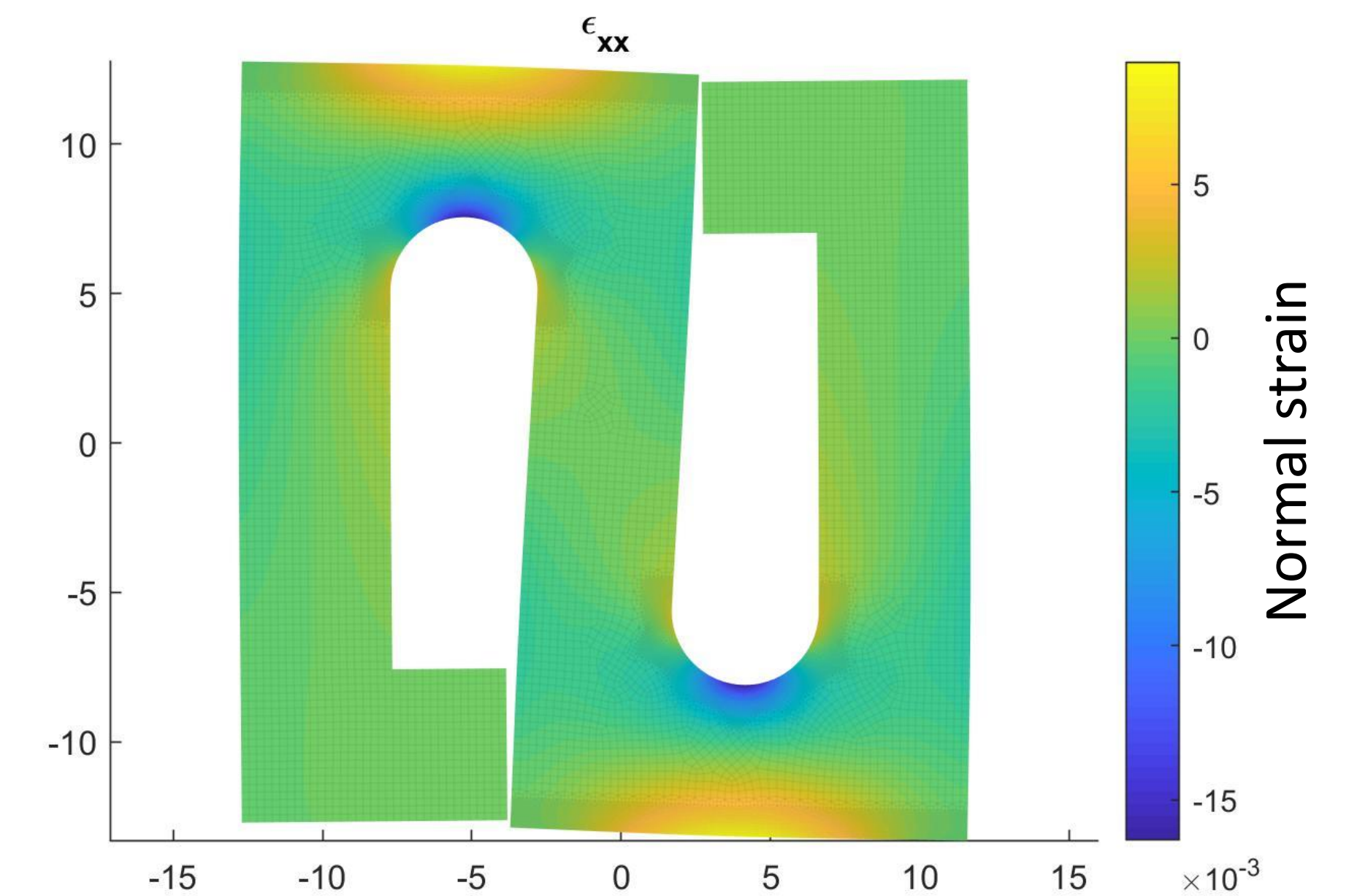
Figure 12. Results of student perceptions of the demonstrations' effectiveness

Research Progress Thus Far

- Optimized transducer design used to convert strain into force by running 2D FEA simulations using MATLAB to minimize stress concentrations and determine optimum strain gauge location for maximum strain
- 3D printed replica of the model shown on the left and used steel rods as pins to translate the force being applied into a reactive force on the transducer
- Calibrated strain gauge to determine the resistive change as a function of weight
- Wrote C++ code on Arduino IDE to calculate the reactive force using the relationship between resistive change and weight

References

Giancaspro, J., & Arboleda, D. (2019). Just a moment – classroom demonstrations for statics and solid mechanics. *2019 ASEE Annual Conference & Exposition Proceedings*. doi:10.18260/1-2--33034



Future Work

Implement the demonstration in future statics classes, this will be done in the upcoming semesters. Determining the effects on the grades of students will be used to determine the conclusion or modifications needed

Acknowledgements

I would like to acknowledgement my mentor, Dr. Jay Oswald for all his help, advice, and guidance throughout this project. I would also like to thank FURI for making all this possible