

Using Sensor Boards to Engage Freshmen Engineering Students

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Introduction and Objectives

- Hands-on problem-solving increases student engagement and learning
- Opportunities exist to make the foundational ENGR 160 more hands-on. Specifically, the existing programming content in ENGR 160 is fairly dry – students write simple code to manipulate data. *During senior exit interviews of ABE students, students indicate that they learn programming best when doing it in the context of sensors and controls.*
- This project attempted to increase the retention and success of students by providing hands-on learning opportunities (via sensors interfaced to PC's) into ENGR 160
- **Objective: Test the following hypothesis:** *Students who learn programming using sensor boards will report increased interest, increased confidence, and higher performance in programming and engineering.*

Materials & Methods



- Sensor boards fabricated by Darr group (ISU ABE), June 2012
- Tested and made operational by undergraduate teaching assistant (D. Amesbury), July – Aug 2012
- Total cost: \$300/board
- Boards used in ENGR 160 with two open-ended projects involving the boards
- Students in the section that used the boards and five control sections completed pre- and post-surveys

Results & Discussion

Students in the sensor boards group were significantly more likely than students in the control group to report:

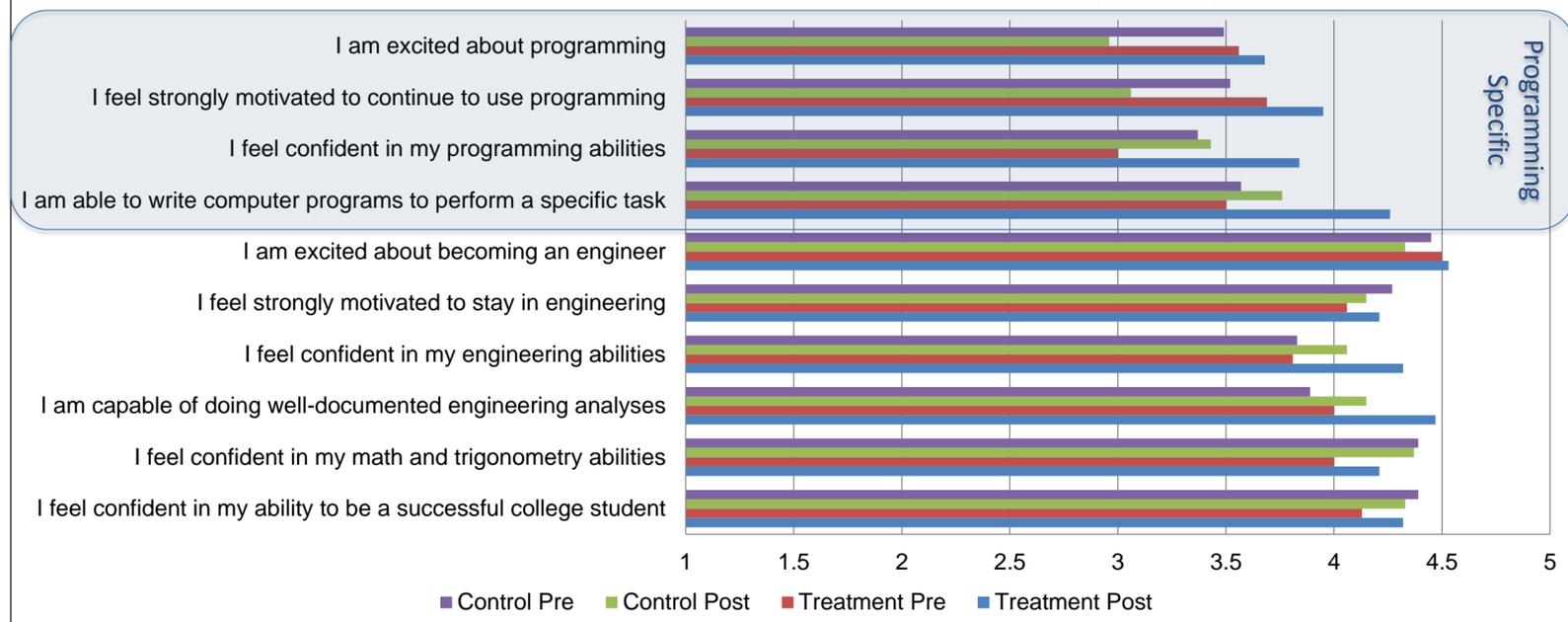
- **Increased motivation to continue to use programming**
- **Increased confidence in their programming abilities**
- **Increased ability to write computer programs**

Sensor board group students also had significantly higher scores on following items (data not shown):

- The class was not boring
- The class was exciting
- The class was interesting
- The class was important



Student Confidence and Motivation Related to Engineering and Programming



Conclusions

- Using sensor boards appeared to have significant impact on student self-evaluation of programming-relevant outcomes
- Using sensor boards appeared to have limited impact on student self-evaluation of non-programming outcomes

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Issues To Resolve

- **What other approaches are being used by FOEE participants to engage freshmen in engineering degree programs?**
- **How do FOEE participants see the role of support courses such as calculus and physics in the broader context of retention in engineering degree programs?**
- **What innovative approaches do Deans and Directors attending FOEE have for incentivizing excellence in the classroom – or dis-incentivizing mediocrity?**
- **What models do FOEE participants recommend for handling growing enrollment without sacrificing the crucial hands-on problem solving that characterizes outstanding technical education programs?**