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## Evaluating teacher professional development in robotics: Data collection 2020

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## Research Question

Will teacher professional development, with the Lego Mindstorms EV3 robotics platform, result in increased computer programming efficacy score and robotics skill score?

## Introduction

This program focused on continued work with Lego Mindstorms EV3 robotics. Teachers self-evaluated knowledge and skills, before and after two, 6-hour workshop sessions.

Xia and Zhong (2018) reviewed 22 papers on teaching and learning robotics content knowledge in K-12. Among the findings was that the questionnaire was one of the commonly-used assessment tools. Kim et al. (2015) studied preservice teachers' STEM engagement, learning, and teaching via robotics. They found improvement in STEM engagement, as measured through emotional, behavioral, and cognitive factors. Tsai et al. (2019) developed a computer programming efficacy scale which can be applied to robotics education. The five subscales included Logical Thinking, Algorithm, Debug, Control, and Cooperation.



*Assembling the robot.*

## Results

The measurable objectives were the following:

1. There will be a statistically significant increase in teachers' scores on a 16-item, computer programming efficacy survey, between administrations of the instrument.
2. There will be a statistically significant increase in teachers' scores on a 10-item, robotics skills survey, between administrations of the instrument.

Results showed a significant increase in computer programming efficacy ( $p < .01$ ) and a significant increase in self-evaluation of robotics skills ( $p < .01$ ). All five subscales of the computer programming efficacy scale showed a significant increase in score ( $p < .01$ ). There was a moderate correlation between the scores on the creativity self-report and the efficacy survey ( $r = .498$ ).

## Methods

During the winter of 2020, 11 teacher participants provided survey data for the computer programming efficacy scale (Tsai et al., 2019), self-evaluation of robotics skills, and a Lego (2016) creativity self-report. The goal was to provide high-quality, teacher professional development to increase knowledge and instructional skills for integrating robotics into the middle grades (4-8) classroom.



*Working with sensors.*

## Conclusions

Five cycles of data collection (2012, 2017, 2018, 2019, and 2020) yielded similar results, with regard to teacher self-evaluation of robotics skills. Data collection, through the computer programming efficacy scale, used in 2019 and 2020, provided a quantitative measure of teacher skills, with regard to the five subscales of the instrument. Further interpretation of subscale data will assist in shaping future teacher professional development sessions.

## Acknowledgements

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