

SACAD: John Heinrichs Scholarly and Creative Activity Days

Volume 2022

Article 32

4-20-2022

Robotics Competition Preparation and STEM Learning

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Recommended Citation

Jarboe, Jay; Saunders, Kyron; Lee, Sanghoon; Cui, Sijia; Gilbert, Emma; Wen, Kaijie; and Lee, Seung-Gu (2022) "Robotics Competition Preparation and STEM Learning," *SACAD: John Heinrichs Scholarly and Creative Activity Days*: Vol. 2022, Article 32.

DOI: 10.58809/EFDU7512

Available at: <https://scholars.fhsu.edu/sacad/vol2022/iss2022/32>

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Robotics Competition Preparation and STEM Learning

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Robotics Team

ROBOTICS COMPETITION PREPARATION & STEM LEARNING

FROM KAMS ROBOTICS STUDENTS

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ABSTRACT

Science, Technology, Engineering, and Mathematics (**STEM**): four of the most important concepts in education, yet some of the most difficult to teach in an engaging manner.

Robotics is an appealing method used to teach STEM concepts in a way that can be applied to a myriad of fields of study, ranging from psychology to computer sciences.

Over the course of the last semester, a research team has worked to create a robot to compete at the International Technology and Engineering Educators Association (ITEEA) **national robotics competition**. Although the Fort Hays State University's team received 3rd overall, this does not compare to the knowledge and experience gained in the STEM field through robotics.

INTRODUCTION

Constructionism is a learning theory that posits the idea that meaningful learning takes place when students construct real objects that are relevant and can be shared with others. Studies have shown that

- Taking a robotics class led to an increase in students' **desire to learn** and their **belief in their ability** to deal with technology (Barak et al. 2016), and
- Teachers had **positive views** towards hands-on work on robotics and integrated STEM in the classroom, and mentioned **student success** at a following simplified scientific method (García-Carrillo et al. 2021).

This semester, our research team worked to design, build, and compete at the ITEEA national robotics competition. Our experience integrated many disciplines and skillsets with a focus on engineering and critical thinking. Through this poster, we will demonstrate our processes and how they correlate with various disciplines.

DESIGN/METHODOLOGY

1. Brainstorming

- Decided to focus on scoring goals because of its efficiency in scoring

2. Designing

- Base: U shape with four wheels
- Arms: catch the mobile goals
- Elevating system: push one end of the seesaw platform down and allow the robot to drive up

3. Prototyping

- In the prototyping process, team members make major decisions together and split up to work on separate tasks. After it is done, the robot is assembled together and tested.

4. Refining and Finalizing

- The refining and finalizing process helps to minimize errors.
- Wheels were added to the arms as a support.
- A claw was assembled to ensure catching goals stably.

Methodology

When creating the notebook as a summary of our research process, we used the method provided by PLTW (Project Lead The Way, Inc.) to generalize the process in 12 steps.

FINDINGS

We face two major problems while building the robot: the problem-solving process and team communication. The focus of STEM-based education: help students develop various real-world applications of skills, including creativity, media, technology literacy, productivity, social skills, communication, and initiative (*The Benefits of STEM Education for Children*, n.d.).

Problem Solving Process

Facing countless trials and errors with many different ways to approach the problem, we could develop real-world problem-solving skills that further STEM-based education in a classroom (Lin, 2015).

Communication

We explained our thoughts and we had to listen to other team members' opinions and feedback, establishing team-based communication skills through the numerous communication processes we do not do in the classroom (Greppi, 2020).

CONCLUSION

Our team was **positively impacted** by the process of preparing and competing at the ITEEA National Robotics competition and gained valuable experience that can be applied to several STEM disciplines.

Our experience competing this year has given us key insight into the amount of preparation needed while competing at the national level and feel like we will be better prepared to have a more complete product next year.

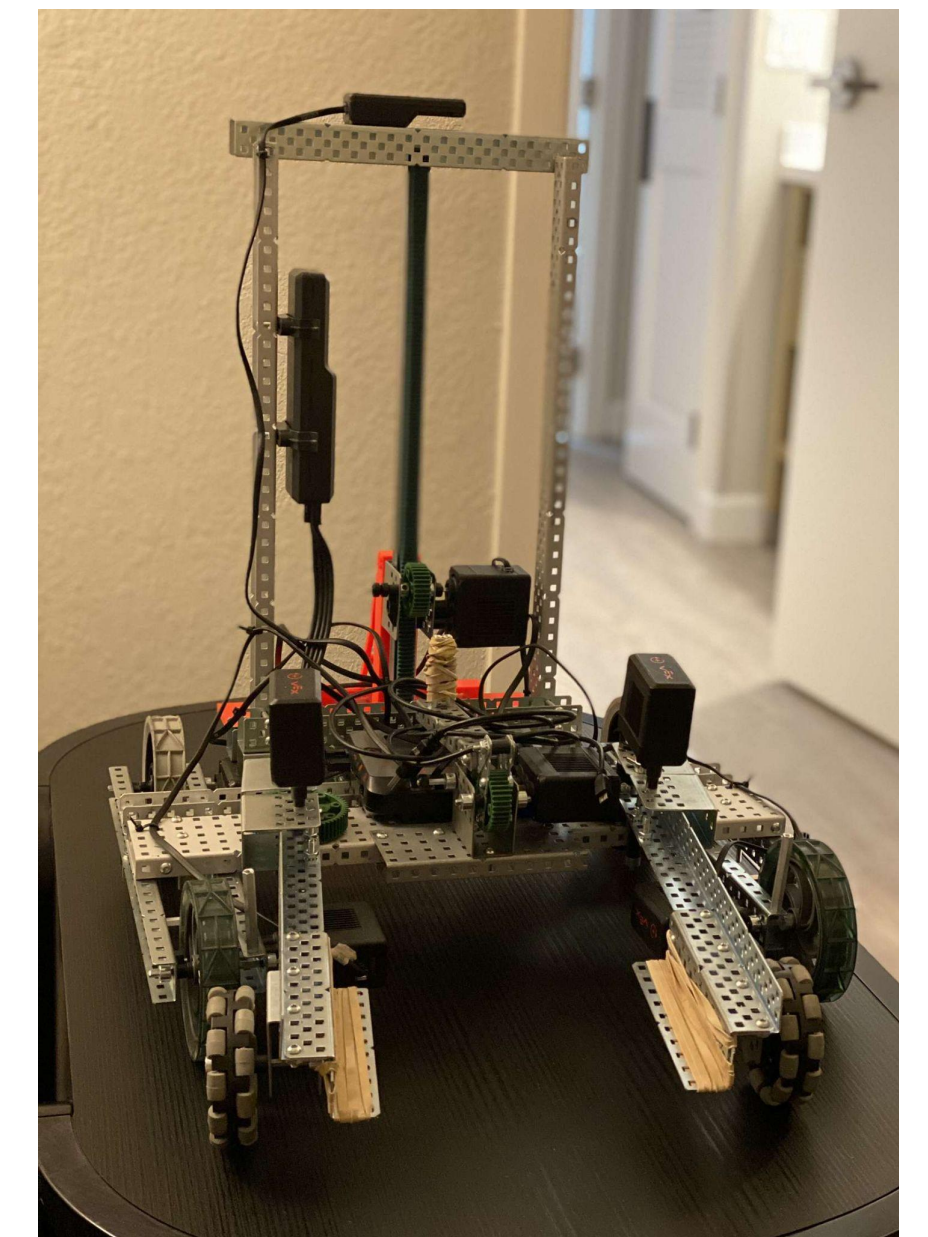


Figure 1: Our robot that competed in the nationals

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