



ROBOTICS EDUCATION &
COMPETITION FOUNDATION

SUMMIT

| ROBOTICS PROGRAMS |



The background is a dark blue grid of squares. Each square contains a different light blue geometric shape or symbol, such as a star, a hexagon, a circle, a square, a cross, and various diagonal line patterns.

Strategic Design

Techniques to guide students through the iterative design process, and develop achievable, measurable goals based on game manual rules and available resources.

Meet Your Presenters

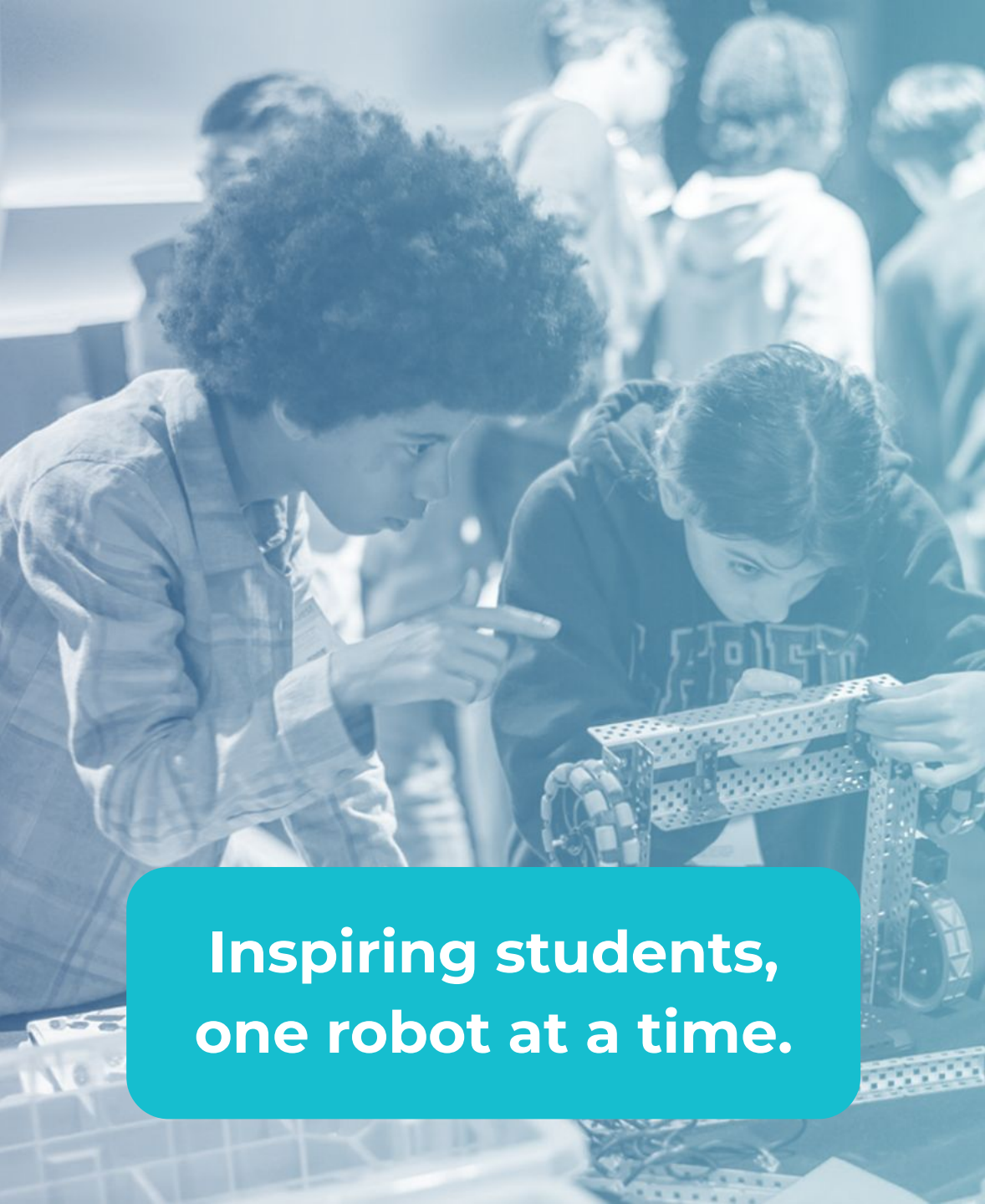
Brandi Bolinger

Senior Program Manager

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Regional Support Manager





**Inspiring students,
one robot at a time.**

Introduction

Mission & Vision



Mission

The Robotics Education & Competition Foundation's global mission is to provide every educator with competition, education, and workforce readiness programs to increase student engagement in science, technology, engineering, math, and computer science.



Vision

We see a future where every student designs and innovates as part of a team, overcomes failure, perseveres, and emerges confident in their ability to meet global challenges.

We Are **NOT** Here To:



DISCUSS GAME CALLS

Your Head Referee will make that decision based on the situation



DICTATE ROBOT DESIGN

Each Team's goals and measurement of success **SHOULD** be different



BREAK THE GAME

Read the rules with the intention of following them, not breaking them

The Main **GOALS** Are To:



TEACH CRITICAL THINKING

Use your role as a teacher or coach to guide students through the learning process



OFFER NEW PERSPECTIVES

What works for one, may not work for another. Steal from the best, and design the rest



ENCOURAGE NEW IDEAS

Sometimes doing a little math can help you identify a strategy that you'd never considered before

***“We are going to relentlessly chase perfection,
knowing full well we will not catch it,
because nothing is perfect.***

***But we are going to relentlessly chase it,
because in the process
we will catch excellence.”***

- Vince Lombardi

What is a Strategy Dictated Design?



Each Season is Going to Look Different

Assessing Your Resources



Understanding the Game Each Year



What do the rules say?

Read the rules in a logical order and take notes for visual learners.

What don't the rules say?

Don't lawyer the rules! But if it doesn't say you CAN'T, maybe you can?



What are you **ALLOWED** to do?

Some things are EXPLICITLY called out as allowable actions.



Strategic Moves & Maneuvers

Game plays are NOT going to be called out - it's up to you to develop them.



What are you **PROHIBITED** from doing?

Some things are EXPLICITLY called out as prohibited actions.

Maximum Benefit Opportunities

Is there a "flow" that you can achieve to get the most out of each match?



Identifying Game Pieces and Timing



Types of Game Pieces

One or multiple types?

Different or same values?

How many of each type?



Access to Game Pieces

What are the starting locations?

Physical access restrictions?

Human-load vs on field?

Are there possession limits?

Can game pieces be reintroduced?



Match Breakdown

Autonomous bonus or Win Point?

End Game bonus or Win Point?

Access time limitations?

Compounding Bonuses?

Identify Scoring Opportunities

Focus on **WHAT** instead of **HOW**

- What *can* a robot do?
- Words that generically *describe* a mechanism or function
- How to break down each *individual task* into smaller tasks
- What belongs *together*, and what are *stand-alone* tasks

Instead of:



Shoot

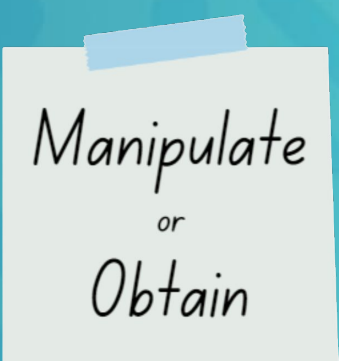


Grab

Think About Using:



Score



Manipulate
or
Obtain

Capturing Scoring Opportunities

STEPS FOR STUDENT-CENTERED SUCCESS:

- Decide ahead of time - digital or physical note-taking
- Designate a Scribe
- Begin leading the discussion to get the ball rolling
- Ask Students Open-Ended questions
- Have *students* populate the notes
- Write everything down, post it, and organize it *later*
- Keep the Students *organized* and *on-task*
- Don't give them the answers!
- If something is missing, *guide* them toward the answer
- Assist with "what not how" phrasing

Strategy

Strategy

Strategy

Strategy

Strategy

Subset
or
Clarification

Subset
or
Clarification

Subset
or
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Calculating Your Contribution

THINGS TO CONSIDER:

- ❑ Are there designated scoring timeframes?
- ❑ How many times can you do the action?
- ❑ How many of each game piece are there?
- ❑ How many of each field element are there?
- ❑ Can your efforts be unscored?
- ❑ Can you perform more than one action at a time?

YOUR CONTRIBUTION:

- ❑ What is the maximum score of each match?
- ❑ What percentage of the max points can you score?
- ❑ How many points per second are you scoring?

Calculating Max Score and Contribution

Imaginary Game Example with Finite Scoring

Description	Accessed During	Quantity Available	Points Per Action	Calculated Max Score	Contribution Percent of Total Max Score	Estimated Seconds Per Action	Points Per Second
Movement Bonus	Autonomous	1*	5	5	4%	2	$5 \div 2 = 2.50$
Autonomous Bonus	Autonomous	1	10	10	8%	15	$10 \div 15 = 0.67$
Game Element A Scored	Drive Control	20	1	20	17%	8	$1 \div 8 = 0.13$
Game Element B Scored	Driver Control	2	15	30	25%	20	$15 \div 20 = 0.75$
Zone Possession Bonus	End Game	3	5	15	13%	5	$5 \div 5 = 1.00$
End Game Bonus	End Game	1*	40	40	33%	10	$40 \div 10 = 4.00$
TOTAL PER ROBOT				120			

Autonomous = 15 seconds

Driver Control = 105 seconds

End Game = 15 seconds*

Prioritizing Scoring Opportunities

QUESTIONS TO ASK YOUR TEAM:

- Realistically, what does our time together allow us to build or accomplish?
- How will our budget affect our abilities?
- Do we have access to the physical resources to make/build/program this?
- Do we already have, or can we find people to help?
- Can we work in parallel, or do we need to work in series?

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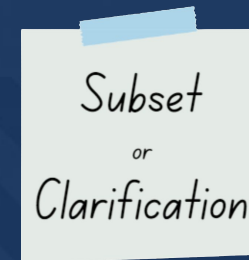
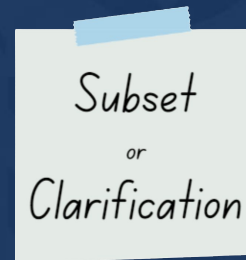
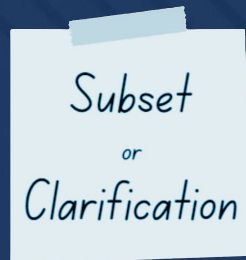
Subset
or
Clarification

Determine Overall Strategy

Must Do



Adequate Resources to Include



Removed



Determining Your Match Play

THINGS TO CONSIDER:

- Are there designated scoring timeframes?
- How many times can you do the action?
- How many of each game piece are there?
- How many of each field element are there?
- What is your travel time?
- Can your efforts be unscored?
- Can you perform more than one action at a time?

YOUR CONTRIBUTION:

- What is the maximum score of each match?
- What percentage of the max points can you score?
- How many points per second are you scoring?
- What is your contingency plan?
- How are you going to coordinate with your Alliance Partners each match?
- Have you calculated your *actual* contribution?



Autonomous

- Action Goal
- Point Goal
- Set up for success

First 45 seconds

- Action Goal
- Point Goal
- Contingency Plan

Next 45 seconds

- Action Goal
- Point Goal
- Set up for success

End Game

- Action Goal
- Point Goal
- Contingency Plan

IMPLEMENT SOLUTIONS



Tips for Implementing Success

ENCOURAGE YOUR STUDENTS TO:

- Read the Game Manual- paying close attention to the red boxes
- Read the Game Manual AGAIN
- Take the Drive Team Member Certifications
- Check the Official Q&A
- Evaluate your Team's resources
- Define Success for each individual and Team
- Check for Game Manual updates
- Set and prioritize their strategic objectives
- Keep the priorities posted in a public place
- Refer back to priorities often
- Iterate, ITERATE, **ITERATE!**
- **Commit to Continuous Improvement!**



Catching Excellence

WHAT DOES SUCCESS LOOK LIKE?

ASK YOURSELF AND YOUR ORGANIZATION:
“HOW CAN I CONTRIBUTE TO THE SUCCESS OF MY TEAM?”

ROLE OF THE STUDENTS:

- Set goals and measures of success
- Work toward achieving excellence
- Be the driving force of progress
- Build the Robot, document the process



ROLE OF THE COACHES AND MENTORS:

- Link the past and present
- Encourage Students
- Assist and enlist help when needed
- Share knowledge and skills
- Assess resources and plan accordingly

THANK YOU

for supporting students
as they develop their
executive skill set.

