How To Start An FRC Team That Lasts

Surviving the first four years (at least)

2056 Ways to Inspire Conference, Sept. 2018

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Celt-X Robotics, Team 5406

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Introduction

▶ Professional Engineer at Stern Laboratories

▶ No previous FIRST experience

    ▶ student competitions at University

    ▶ Dr. Woody Flowers inspired me to become an engineer in the 90s!

▶ Joined MakeShift Robotics 4039 in 2014

▶ Co-Founded Celt-X in 2015

    ▶ Rocky road to success, but great support from HWCDSB

▶ More work than I ever expected. Leadership especially. But it's been fun*

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▶ *One of those weirdos who enjoys suffering if it leads to a feeling of accomplishment (So take everything in this presentation with a grain of salt!)

Presentation Outline

1. FRC is harder than you've been told
   getting a <u>realistic</u> grip on the challenge

2. How you can improve the odds
   (advice from the 5406 experience)

3. Why it's worth the work!
   (motivation collected from other successful teams)

4. Open Discussion

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FRC is Harder
Than You've Been Told

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Background

► FIRST Robotics Competition founded 26 years ago

  ► Based Dr. Flowers' "Introduction to Design and Manufacturing" class challenge at MIT

► Original Teams were partnerships between high schools and companies like Boeing, Xerox, Motorola …

► Goal was to make STEM as exciting (and competitive) as high school sports

  ► inspire students to pursue STEM careers (which had a bigger stigma in the 90s)

► So strong competition, big (expensive) spectacle, adult participation are all "baked in".   Very unique.

► "Gracious Professionalism" keeps this crazy thing centered

"Known Unknowns" as a lead mentor:

- Mentor recruitment
- Student recruitment
- Training
- Safety
- Fundraising, grant application & Sponsor care
- Access to tools
- Material supply
- Storage space
- Robot design

- Robot build
- Project management
- Drive team selection and practice
- Transportation and accommodations
- School permissions and paperwork
- Competing at your best
- Scouting
- Branding and

- marketing
- Outreach
- Awards
- Herding teenagers
- Wrangling parents
- Team conduct
- Keeping up morale
- That feeling that you're forgetting something

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"Unknown Unknowns" as a lead mentor

▶ No Lesson Plan
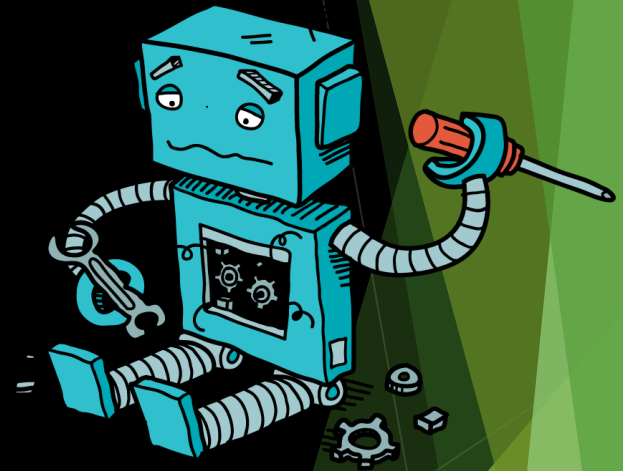No one has ever built a "Destination Deep Space" Robot. There is no kit, there are no instructions

▶ You lead a volunteer company
Commitments change, and you can't do much about it

▶ Murphy's Law rules
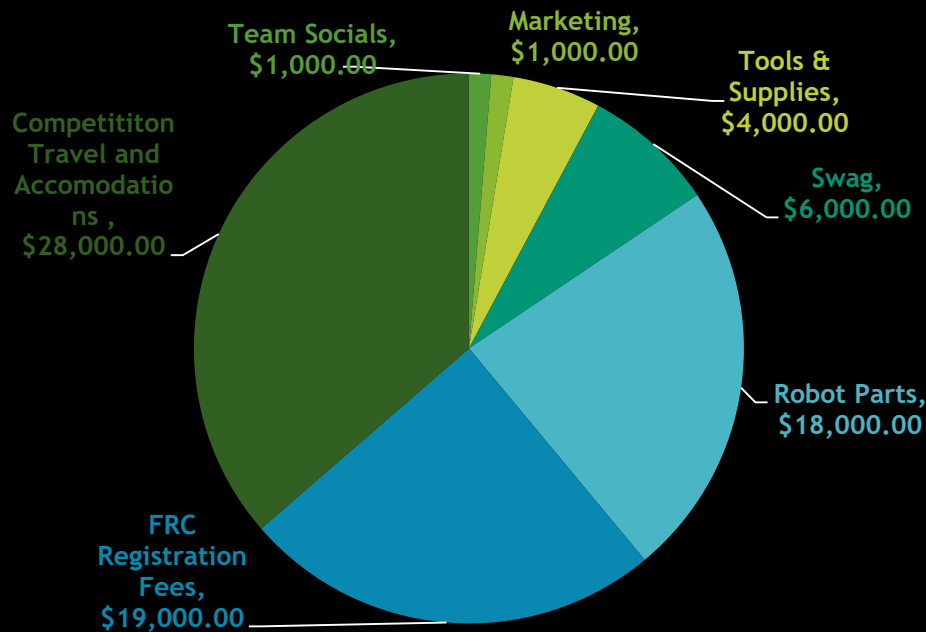Things are going to break, and you aren't going to be prepared

▶ It isn't "fair"
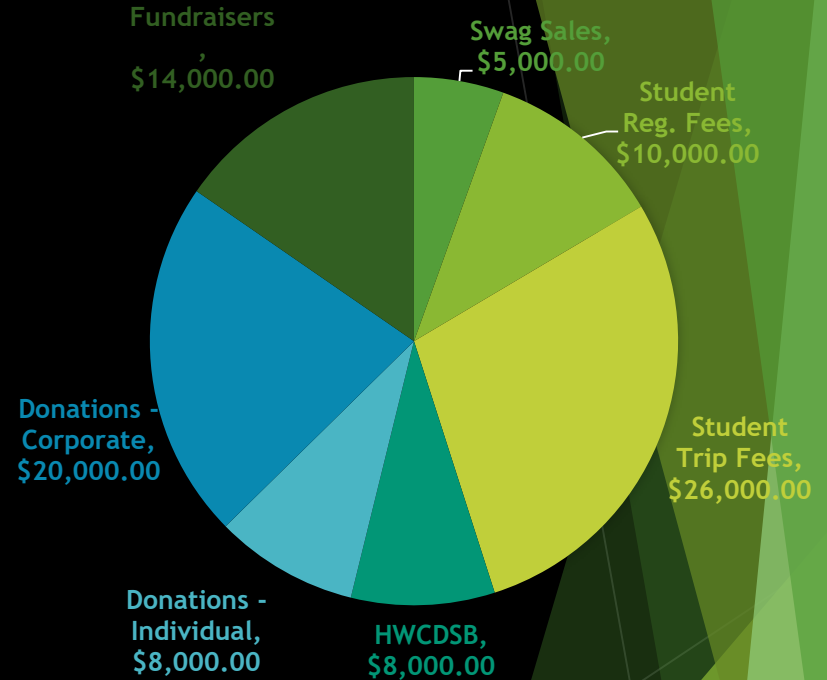You'll be compared with teams that have more (and less) resources.

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The cost of the program is staggering

Expenses

- Team Socials, $1,000.00
- Marketing, $1,000.00
- Tools & Supplies, $4,000.00
- Swag, $6,000.00
- Competititon Travel and Accomodations, $28,000.00
- Robot Parts, $18,000.00
- FRC Registration Fees, $19,000.00

Revenue

- Fundraisers, $14,000.00
- Swag Sales, $5,000.00
- Student Reg. Fees, $10,000.00
- Student Trip Fees, $26,000.00
- Donations - Corporate, $20,000.00
- Donations - Individual, $8,000.00
- HWCDSB, $8,000.00

Rough 2018 Budget: ~80 k$

Even a very cheaply run FRC season (1 robot, 2 travel comps) would be 20-30 k$

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The hours required are more than you can spare

meeting hours per week 2018
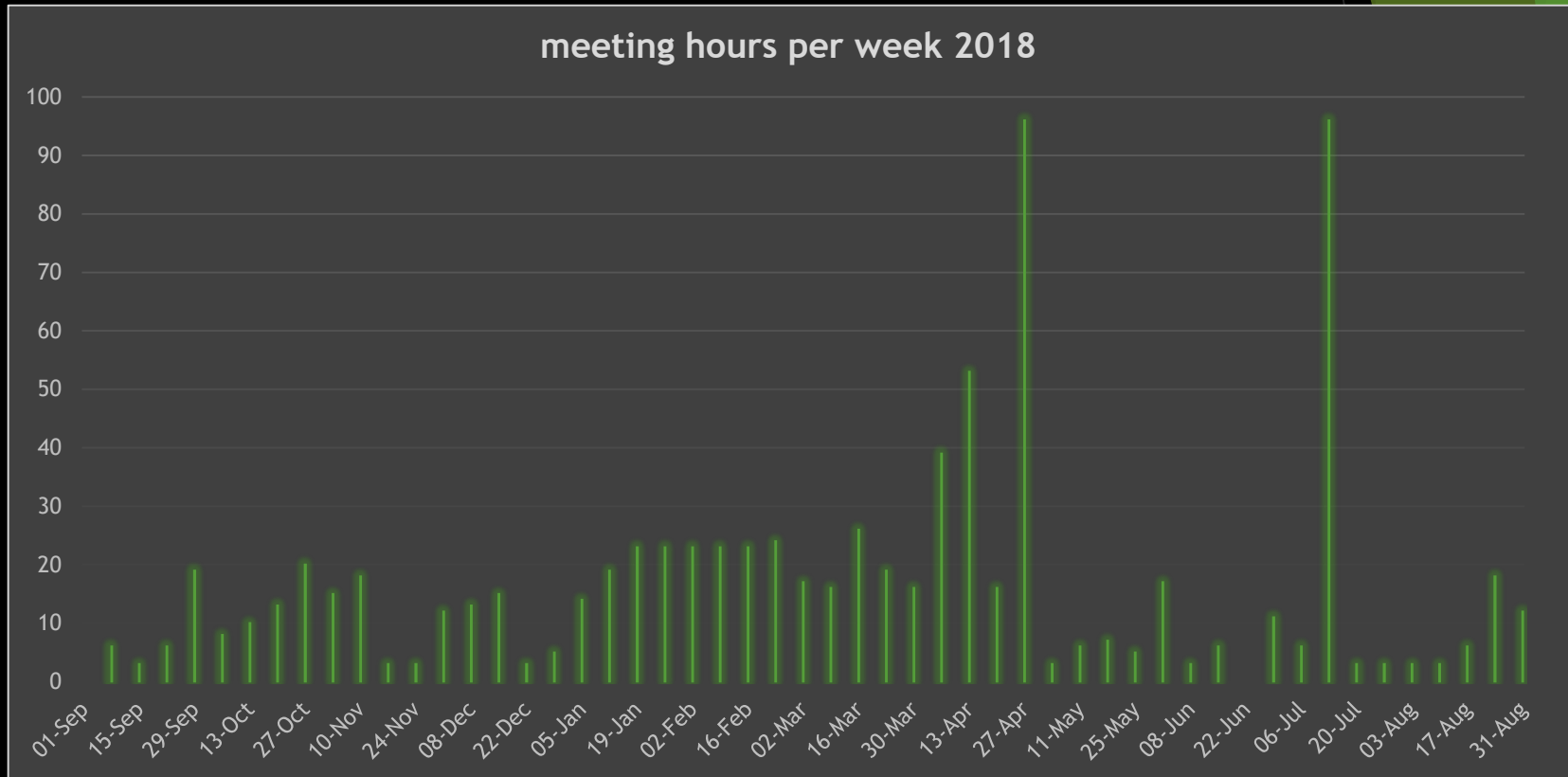
Most teams don't make it

Rookie Year	# of teams founded	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1992	8	63%	75%	88%	100%	100%	88%	100%	88%	88%	88%	88%	88%	88%	100%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%
1994	6	0%	0%	100%	83%	83%	83%	83%	83%	83%	67%	83%	83%	50%	50%	33%	33%	33%	33%	33%	50%	50%	50%	50%	50%	50%
1995	19	5%	0%	11%	100%	89%	84%	84%	74%	74%	58%	63%	68%	68%	68%	58%	68%	68%	63%	63%	63%	68%	68%	63%	63%	58%
1996	25	4%	0%	0%	0%	88%	80%	92%	92%	92%	80%	80%	76%	76%	76%	72%	76%	72%	72%	76%	76%	76%	76%	76%	76%	76%
1997	50	0%	0%	0%	0%	0%	96%	88%	80%	80%	80%	72%	74%	74%	68%	66%	64%	64%	64%	60%	62%	64%	60%	60%	60%	60%
1998	55	0%	0%	0%	2%	2%	4%	93%	84%	85%	80%	84%	80%	80%	75%	73%	71%	71%	67%	64%	60%	56%	55%	55%	56%	56%
1999	98	0%	0%	1%	1%	0%	1%	0%	95%	86%	84%	80%	76%	71%	67%	63%	62%	62%	64%	62%	63%	59%	59%	59%	60%	58%
2000	122	0%	0%	0%	0%	0%	0%	0%	0%	98%	89%	76%	75%	68%	65%	64%	61%	61%	57%	53%	49%	49%	44%	43%	43%	40%
2001	186	0%	0%	0%	0%	0%	0%	0%	0%	1%	97%	83%	71%	62%	60%	56%	52%	50%	47%	45%	45%	44%	44%	42%	41%	41%
2002	193	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	98%	85%	77%	65%	60%	54%	51%	48%	47%	45%	42%	42%	41%	41%	39%
2003	203	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	97%	83%	63%	56%	47%	43%	41%	37%	37%	33%	31%	30%	29%	28%
2004	219	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	99%	80%	69%	59%	54%	51%	48%	45%	42%	41%	40%	38%	38%
2005	186	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	94%	84%	81%	77%	72%	63%	58%	56%	54%	51%	47%	50%
2006	240	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	95%	82%	72%	65%	62%	57%	52%	49%	45%	44%	44%
2007	265	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%		95%	85%	72%	65%	56%	52%	51%	48%	46%	44%
2008	327	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		98%	80%	71%	65%	61%	58%	56%	54%	53%
2009	324	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		98%	86%	76%	67%	62%	59%	54%	55%
2010	279	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		99%	86%	75%	68%	65%	61%	59%
2011	424	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		96%	81%	71%	63%	59%	55%
2012	476	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%		96%	85%	73%	67%	62%
2013	411	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		88%	74%	67%	63%
2014	449	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%		84%	76%	69%
2015	387	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%		93%	81%
2016	438	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%		91%

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How You Can Improve the Odds

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# How You Can Improve the Odds

▶ My Six Suggestions:

A. Be prepared before you commit

B. Once you decide, get passionate!

C. Set achievable, but inspiring goals

   Actively manage the team accordingly

D. Grow better through sharing

E. Nurture your volunteers

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A. Be Prepared Before you Commit

▶ Get a realistic sense of the work

▶ Do you have everything you need? Can you get it?

  ▶ Money, space, time, tools, mentors/volunteers

▶ Decide honestly if you have what you need to be successful

  ▶ If not, it's OK to wait!

  ▶ FTC, Vex are great options, much easier
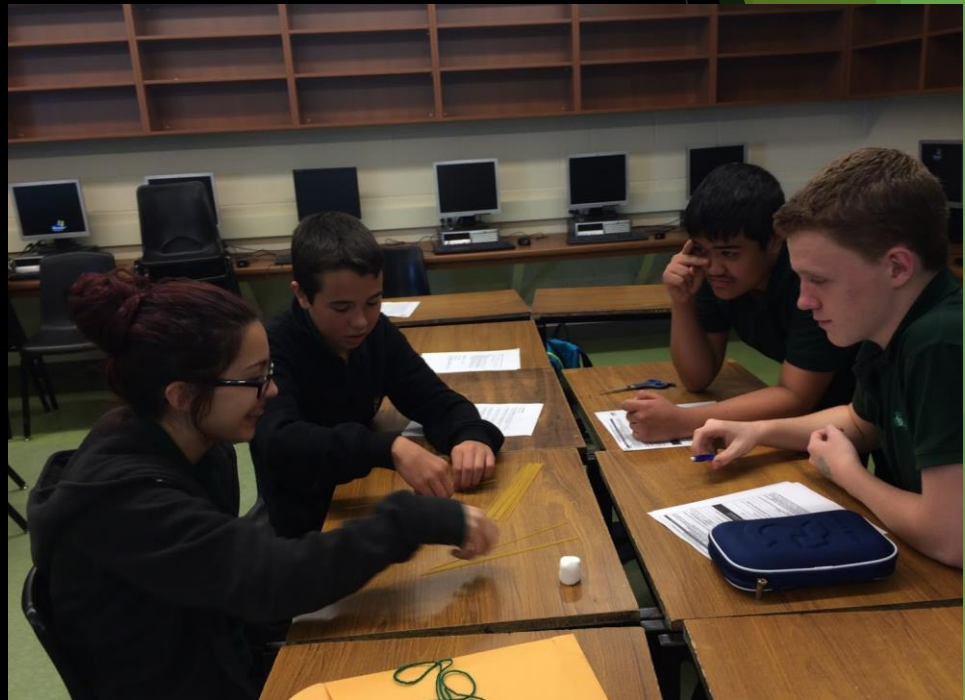
B. Once You Decide, Get Passionate!

▶ You need to enjoy this to justify the work

▶ Students will take their cue from your attitude

   ▶ Mentors, parents, sponsors too

▶ Risk looking stupid for Celt-X ☺

▶ I could spend all season reading the FRC blogs, vlogs, social media. Easy to get swept up!

C. Set Realistic but Inspiring Goals

▶ Set goals each year as a team

  ▶ Inspiring enough to push you

  ▶ Realistic that you have a chance (of at least getting closer) – need that sweet accomplishment hit

  ▶ Doesn't have to be robot performance (but winning helps)

  Celt-X 2015 goals:
  ♩ Recruit 20 students
  ♩ Build a robot that works in all of its matches
  ♩ Earn a rookie award

  ▶ Create a 4 year plan – it gets easier if you can make it that far

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C... Actively Manage Towards The Goal

▶ Schedule ruthlessly

  ▶ Have backup plans and cut scope when necessary.

▶ Plan to finish early

  ▶ time left to finish the things you didn't plan for.

▶ Lots of management styles work. But make sure your are steering the ship!

▶ Highly recommend summer 1/week meetings

  ▶ learn, play outside pressures of comp.

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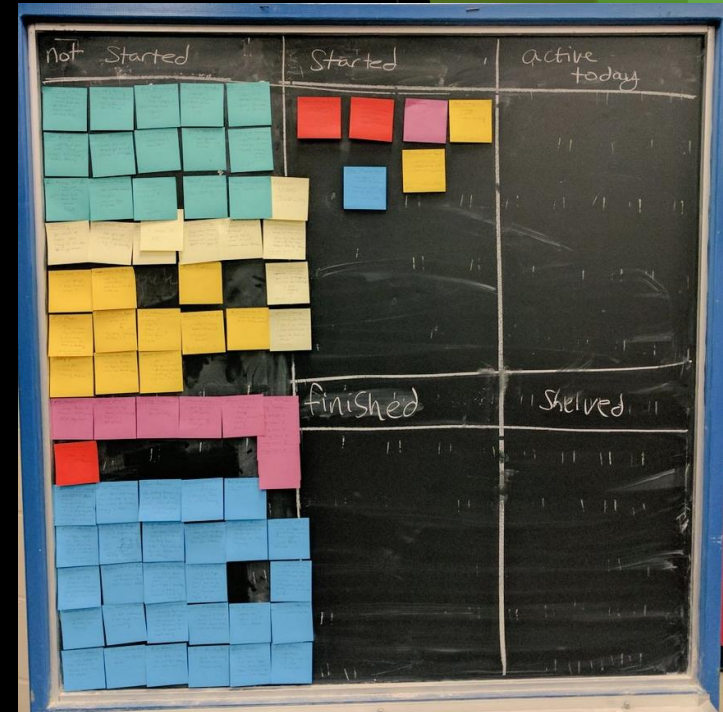
D. Grow Better Through Sharing

▶ Teams have different resources, but they share!

▶ Robodrome

▶ This Conference

▶ STEMley Cup Pre-Rookie Program

▶ 865's shop offer

▶ ChiefDelphi

▶ Compass Alliance

▶ YouTube

▶ AndyMark and Vex Pro

▶ Reach out, ask!

▶ Give back when you can

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Welcome to the Robodrome!

E. Nurture Your Volunteers

- ▶ Be clear about what you need – you'll be surprised who steps up
  - ▶ Thank you Celt-X Family!
- ▶ Look to transfer responsibility (but not too early)
- ▶ Take care of yourself too!

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3
Why It's Worth the Work

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What keeps successful teams going?

▶ I sent a survey to some lead mentors that I know and respect asking what their "secret sauce" was for running a successful team.

▶ Answers were surprising, inspiring
As much about "how" to be successful as "why".

▶ Shows how FRC is full of great people, doing great work – it's a rewarding place to give your time

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"How do you measure success?"

For overall team success, I like to look focus on student engagement; "did the students feel ownership and pride over the team and robot". One metric I've always liked is "how many of the students on the team that year stayed involved in FIRST in some way or another after graduation". I always felt that if we created a lasting passion for FIRST and its values in some of the students that we were doing something right.

For robot success, obviously general on field success is important, but I also was big on reliability. "How many times did we let our partners down?" is a big one.

- Karthik Kanagasabapathy, previously from 1114

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"What are the most important factors explaining your team's success ?"

1. dedication

2. hard work

3. living within your means

4. parent/mentor/sponsor engagement

5. luck

   - Matt Alderson, 4039

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"What were your biggest struggles during your team's first four years?"

Figuring out a schedule that meets our standards for performance but is still sustainable for our mentor base. Working Smarter and Maximizing efficiency is better than a brute force approach to working hours.

- Tyler Holtzman, 2056

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"What's one thing you know now that you wish you knew back then ?"

the longer term impact of FIRST: early on our team concentrated so hard on the kids learning new skills, fielding a competitive robot and spreading the FIRST program - the rewards were measured in terms of the incremental growth of each team member from season to season. More recently, as our original/founding kids are now graduating post-secondary, we have seen where these young adults are headed. They drop by the workshop and recall their time on the team and how it shaped their path. These are the long-term success stories that keep our mentors coming back year after year and fuel the program.

- Matt Alderson, 4039

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"Other thoughts on the subject of team sustainability?"

Breaks are important - don't burn your students or mentors out;

take on hard challenges - completing them is rewarding;

work with other teams - there is a lot to learn.

   - Chris Pinto, 5406

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My Motivation
Robots Building Students!

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Thank You
Open Discussion

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