Mentoring

What A Job!

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Revision History

Date	Version	Writer	Changes
4/19/2016	1.00	Wayland Kwock	Initial document
4/16/2017	1.01	Wayland Kwock	Added the stages of building
12/6/2017	1.02	Wayland Kwock	Added Appendix A

Purpose

Congratulations on your purchase of the Fermi Heavy Industries, TK421, 36 megawatt laser cannon!

Sorry. Wrong document. Take 2!

Congratulations! You've been asked to mentor a robotics team. This is a reflection of:
- Your skill at what you do
- Your encyclopedic knowledge in your skill set
- Or perhaps the team just needs help and you were around

Seriously though, this request is to help mold the minds and experiences of soon to be adults who know everything (this will come up later), This is the opportunity to share the knowledge you have gained over the years to a willing audience.

With the disappearance of the do it yourself mentality and the disposable nature of consumer products, this is the first exposure the students will have to many tasks, ideas, and concepts.

However, you don't just show up and have the kids throng about you begging you to dispense knowledge on everything from Kirchoff's law to how to thread a needle as if you are the fountain of all that can be known.

The audience for this document is a new or potential mentor that hasn't set foot into a robotic team's domain. Over the years, I've seen a number of people recruited as mentors drop out because their expectations weren't met or they didn't know how to contribute. I hope to level set your expectations and give you insight on what is about to happen as well as equip you with what questions you should be asking the team.

My background for this is from 4 years of helping Team 3008 during my son's career as a high school student. I was immediately attracted to what the team was doing and how they were doing it, so much so that I intend to continue helping them although I no longer have a son in the game.

And although I have direct experience with only one team, I've had enough exposure to many teams during regional competitions as well as the world championships to observe how they operate as a team.

What follows is a distillation of my observations on how different types of teams operate and what you can expect from that type of team. So without further preamble, let's explore the team types.

The Apprenticeship Team

This type of team is very structured and is probably what you are expecting. The coaches and mentors are the leads in the various aspects of the build and directly teach the students how to do things and the students follow up by demonstrating what they were taught while being monitored.

This structure is more typical when there are a number of mentors available with a varied skill set. It also requires mentors be able to dedicate more time to the effort to monitor and correct students.

The Student Led Team

This type of team is basically the lunatics in charge of the asylum. They create their own plan and design and rely on mentors as a resource to fill in what they don't know.

Okay, it's not pure chaos. The team typically has a plan, methodology, and direction, but lack the experience to pull it off. That's what you're there for - to be the voice of experience and to provide guidance.

This type of team may frustrate mentors as there will be long periods of time where there are no questions and problems to address. You may be idle for stretches of time and that will make you question why you're there.

You will also see problems and want to step in to correct them, but that would morph the dynamic of the team into the apprentice model. All you can do when you see a problem is to make suggestions. Of course, if the team is about to compromise their safety, step in immediately to resolve the situation.

The amount of time commitment for this type of team is very variable as your input is only required when the team decides it needs input and it's this waiting game that makes people wonder if they are having any effect.

The Force of Will Team

These teams are small teams and barely have resources, but they exist because the students want to participate in robotics.

Because of lack of resources, these teams need the most help, but the lack of resources will require extensive "outside of the box" thinking. If you're MacGuyver, these teams need your help and would appreciate any contribution you can give. As these teams are typically small, you will be more hands on than with other types of teams.

In addition to mechanical know how, project management skills will be greatly in need.

These teams can use all the help they can so any time you can spare will be appreciated.

New Teams

This is similar to the "Force of Will" teams, but these teams have no institutional knowledge to rely on. They don't know what they don't know and neither will you.

Be prepared to read and interpret many rules and procedures. Your key resource will be other teams. Gracious professionalism is part of the robotics mindset and most mentors and coaches from other teams are willing to share their knowledge. We want to have a good time contesting the game and we want other teams to share in that experience.

As with force of will teams, new teams can use all the help they can so any time you can spare will be appreciated.

Types of Mentors

As with teams, there are many types of mentoring styles. Of course, the type of team will influence the mentoring style that you can adopt or are expected to adopt. Also, if your style isn't compatible with the type of team you're involved in, you'll be a square peg in a round hole.

Hands On

Suited for the apprenticeship model, this type of mentor will know and will be able to demonstrate how to do things in their realm of expertise (or can fake it effectively). Force of will teams and new teams will also require this type of assistance.

In some teams, mentors will be designing, constructing, and troubleshooting robots as much as, or sometimes more than, the students. This mentor probably would have loved to have a robotics program when they were in school.

Hands Off

This is appropriate only for student led teams and requires patience and perhaps a good book. This mentor's repository of knowledge, skill, and experience will sometimes present their knowledge and inject their input as problems crop up, but a lot of time will be spent waiting for those opportunities. If you're not prepared for long periods of waiting punctuated by tiny emergencies, prepare to climb Mount Disappointment.

Trimtab

"Call me Trimtab" is written on Buckminster Fuller's tombstone. The genius behind the geodesic dome as well as many other inventions, concepts, and published works felt that as significant as others perceived his contribution, he could never compare himself to the rudder of a ship. Rather, he was the trimtab - making a small contribution that affected how well the ship rode in the water, but not responsible for the direction of the ship.

This type of mentor actively seeks out problems and suggests solutions. They may also look over shoulders and make recommendations and then leave. They contribute their experience, but they should have no expectation that their recommendations would be implemented much less acknowledged. Remember, the student was already performing the task, so as any good teen already knows, the way they are doing it is the best way. You may want to prepare an explanation or example of why your way would have been better for AFTER they complete the task. Or you can just let them botch the task BEFORE you speak up - assuming it's safe. Some lessons are best learned the hard way.

Of course, students can approach this mentor for their input and as the mentor proves their value, expect more questions.

Ill suited for the apprentice type team, this type of mentor works best with student led teams when combined with the Socratic method ("I drank what?!?:). You have provided your knowledge while still having the team figure out the final answer.

Types of Students

You will encounter a variety of students as a mentor so you may as well be warned.

Also remember this, unless robotics is part of a formal class, they are all volunteers. Sometimes they are laser focused on the task, and other times it's like herding cats.

I Know This!

Ah. Youth. When I knew it all. This type of student probably has some grasp on what and how they're going to do something, but sometimes not at all. Usually headstrong, all you can to to help is to make stronger and stronger suggestions or use the Jedi mind trick to make them believe it was their idea all along. It works for terriers, it works for students.

I Have No Idea What I'm Doing

Ah. Youth. When I was completely clueless. These students want to do things, but have no idea how to proceed. Whether it's because the task and/or tools are completely foreign to them, they seek out and gratefully accept advice.

I'm Waiting!

Ah. Youth. When I didn't have to figure out what to do because I'm used to being told what to do. Students are sometimes not used to being self-starters and need to be told what to do and how to do it. Sometimes they will wait until knowledge falls out of the sky. You are that knowledge. If you see a blank stare at some task, check if they're awake and then ask if they need help.

What Am I Doing Here?

Ah. Youth. When my parents told me to do something it'll look good later on.

These students may just be looking for something to do with their time or trying to find their fit somewhere in school. If you recall, it was an awkward time. If they haven't found their niche in the team, all you can do is to engage them as much as possible and try to help them find their niche.

The Build Season

In my experience, there are four stages of the build season, each of which I associate with a different set of tools that I bring.

Of course, all of these items are usually available at the shop, but having your own speeds up the process and ensures they are in good working order.

Design

During this stage, the game requirements are still being analyzed and understood and possible robot designs are being considered.

For this I usually have:
- A printed copy of the game manual for reference and analysis
- Tape Measure - to estimate sizes of elements and playing field

Field Elements

As the robot is being designed, the field elements to test the robot can be built - typically out of wood. Don't forget to do intermediate design reviews at this time.

- A printed copy of the game manual for reference and analysis
- Tape Measure
- Carpenter's pencil
- Ear protection
- Safety glasses

Robot Build

- Tape Measure
- Sharpie pen
- Welding helmet
- Welding gloves
- Ear protection
- Safety glasses

System Integration / Testing

- Tape Measure
- Sharpie pen

Conclusion

There it is. That's all I know about mentoring. Looking back, it's not much.

With this newfound anti-knowledge, you can ask the appropriate questions of those that are recruiting you to figure out where (or if) you'd fit into the robotics team.

Hopefully you choose to help the team that's trying to Shanghai you. I've found it rewarding to watch the team members grow their abilities and mature out of their larval stage.

PS

"Wait!" I hear you cry. "There must be more!"

Only a little bit. Team 3008 is a student led team and I try to be a trimtab so that's what I know best. But as I try to influence the next generation of engineers, scientists, and the caretakers of our future, I try to treat the students more as colleagues where appropriate. I do this because I've had people growing up that have only known me as Mr. Kwock get hired at my workplace and then have the awkward transition to treating me as a co-worker.

Robotics students will shortly be part of the workforce. I believe it is time for them to start that transition to the professional world, so they can address me as Mr. Kwock, Wayland, or "The All Being, Master of Time, Space, and Dimension". I'm still waiting for that last one, although "Wayland, Son of Frank" does get some air time.

Good luck!

Appendix A – Quote to Ponder

After years of watching students build robots and interact with each other, these quotes sometimes pop into my head and I try to communicate these ideas as best as I can.

"Stupid hurts." – *Universal Constant, right up there with the speed of light and Planck's Constant*

"Luck is the residue of design." – *Branch Rickey*

"Psychologically, the more momentum you gain in pursuing something, the less interest you have in exploring whether it even makes sense." - *Amy Alkon, "Wedding Duress And The Smother Effect", Midweek, November 22, 2017. Page 51*

"He who established his argument by noise and command shows that his reason is weak." *Michel de Montaigne*