FIRST® LEGO® League Virtual Programing Guide

An unofficial guide to FIRST LEGO League in the era of Coronavirus

hub.jaredhk.com/virtual

UPDATES

6/10/2020 - ***** Fixed some permissioning issues so all users should now be able to download as a PDF or access through any method without the need to sign in or request access. My bad :)

5/21/2020 - ***** Modified the robot game section to include updates about deprecated LEGO Digital Designer (thanks, Carey!). I now recommend Studio 2.0 from BrickLink. More info below. ***** Added section on file storage (also in the robot game section), recommending EV3Hub (thanks, Kristine!). ***** Updated the FAQs to include info on preparing students for the season and sample questions for judges.

Contents

Introduction

Like everything else around us, FIRST continues to be greatly impacted by COVID-19. There are many unknowns with how FIRST LEGO League (FLL) will run for the season that would traditionally begin in August 2020 and culminate with the World Festival in April/May 2021. One thing we can expect is regional variance. FIRST will likely implement some global standards as well as some recommendations, but like everything else in FLL, the Program Delivery Partners (PDPs) will have tremendous discretion with their implementation. This guide is meant to help you with your season, however that turns out.

One extreme word of caution: every region is different, as is every team, every school, and every individual. This document does not provide medical advice, nor is it meant to take a position on whether or not your team or event should continue in person. Those decisions are best left up to our medical professionals, school districts, and other government officials. Please heed their guidance when making decisions and keep in mind that no two situations are the same. Likewise, FIRST has yet to publicly release their global standards. Once they do, it is possible that this guide sees serious modifications.

About the guide

This guide aims to provide you with the tools you need to successfully run a modified FLL program, in the event that you cannot meet in person. I may recommend specific apps or tools throughout the guide. These recommendations are made at my sole discretion and I'm not being sponsored to include them. If you don't like them, that's completely fine. This guide is designed for coaches/mentors, judges, and event organizers. As always, judges should consult with their Judge Advisers and event organizers should consult with their Operational Partners.

Who am I?

This guide is made by me, Jared Hasen-Klein. I'm a student of Political Science and a long-time supporter of FIRST. I

participated in FLL as a student for four years, as an FRC student for an additional four years, and have held various volunteer positions at over 75 FIRST events. I'm a Judge Adviser, Tournament Director, and just about any other role which needs help. I run hub.jaredhk.com which provides free resources for FIRST teams. You can contact me at jhasenklein@gmail.com with questions or comments.

Acknowledgments

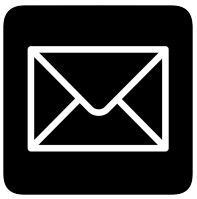
I just want to take a quick opportunity to thank those who looked at the guide and provided suggestions: Lloyd Kwan and Nick Hammes.Several individuals helped me review all or parts of this document, but I take full responsibility for any inaccuracies or errors and all opinions. If you spot an issue, please let me know.

Team Communication

Most FLL teams do the bulk of their communication through in-person meetings. In the event that your team cannot meet in person as regularly (or at all), you may wish to consider alternatives.

There are lots of great communication apps out there. The best app or tool is the one that works for you. I cannot stress this enough. If you want a starting point, though, here are some of my favorite tools:

Email



Email may sound like a basic tool, not even worth mentioning on this list. It is precisely because it is so common that I recommend it. All of your parents probably have email, and in many cases the students will, too. Email is best for mass communication or answering individual questions. That being said, kids tend to not check their email regularly, so this is probably best when you want to convey large amounts of information.

Slack

Slack is a great tool for messaging. If you are not familiar with it, I highly suggest you check it out at slack.com. You can create multiple channels for different topics (for example, you could make #general #robot-game #project #core-values and more) to easily sort information, add lots of useful apps, mention specific users or groups, share files, and a ton more. Esentially, the app allows you to have many specialized, organized group chats on different topics. Many FRC teams use it quite successfully. Slack has age restrictions of 16 years old on its normal accounts and 13 on its education accounts, so

please be cognizant of that. There are some alternatives to Slack without the restrictions, but please read the Terms of Service first.

Google Classroom

Google Classroom is a free Learning Management System (LMS) software made by Google. It allows you to create an internal website where you can post resources, announcements, etc. You can even create assignments and provide comments on them, and there are discussion boards for students to interact. It is pretty customizable. If you are already at a school and that school uses a different LMS, talk to your IT department about setting up a "class" for the robotics team. That way, the kids will already know how to use it.

Google Classroom is easy to use and does not require you to be a teacher to sign up. It integrates seamlessly with Google Drive products (Google Doc, Sheets, Slides, etc).

Video conferencing software

Most people who are either students or working professionals right now have experienced some kind of video conferencing software. If you are part of a larger organization (such as a school) that has an existing platform, you should continue to use that platform. Otherwise, it is really a matter of personal preference. Zoom is great, though you'll pay a lot for premium features. Google recently made Meet available to all people with a free Gmail account—it's a great emerging platform to try to get some of those premium features for free. Communication apps like Slack also have built in video conferencing features which may be good enough for your purposes.

FIRST's solution

We anticipate that FIRST will release some tools for team communication and collaboration. Once those are released, check back here for updates.

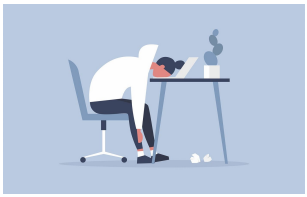
Running effective video meetings

Those of you who have been using video conferencing software for work or school know that it can be quite difficult. You've also probably noticed that some people are using it much better than others. To avoid "Zoom Fatigue," there are a few techniques to consider implementing:

Take breaks

In a traditional FLL meeting, you might be able to go for an hour or two without taking breaks. It is hard for many kids to sit still under normal circumstances. For every 30 minutes of video activity, I recommend at least 5 minutes of break time before moving on to the next part. You can provide structured breaks occasionally, but periodic unstructured time is ideal.

Does this really need to be a Zoom meeting?



If your primary purpose of a video meeting is to disseminate information, do it a different way. Meetings should be saved for when there is meaningful dialog to be had. Limit your meetings to only be those which are essential and send announcements of written communication when possible. Likewise, “pre-Zoom-Zooms” to prepare for future meetings are generally time wasters and can often be frustrating for participants. Think twice before creating a meeting.

Set some ground rules

Should people be on mute when they aren’t speaking (hint: yes)? What’s the protocol when someone has a question? Is video required to be turned on? Whatever your rules are, make it clear from the beginning.

Stick to one platform - establish consistency

Adjusting to FLL from home is going to be difficult. To make it a bit easier, stick to one platform for video conferencing, and try not to change up protocol too much. For example, if you want certain security features turned on like waiting rooms and passwords, they should always be on (or always off). Likewise, try and stick to a schedule. Maybe that’s Mondays and Wednesdays from 2:30-4:30. If it is, stick to it. You can modify it when approaching deadlines or learning what works and what doesn’t, but if you think you might need some of that flexibility later on, warn your participants at the outset.

In addition to avoiding Zoom Fatigue, we also want to keep the meetings fun and productive. See the section on structuring meetings below.

Structuring meetings and teams

There is a wide variety of ways in which coaches structure their team meetings. Some have certain days devoted to the robot game, others to the project, and others to core values. Some split the time evenly at each meeting, and others break up into smaller groups or do something in between. You can still do that, but in order to avoid burnout and maximize productivity, I recommend doing a bit of each at every meeting. You also will have to implement more independent work this year if you cannot have in-person meetings. The recommendation below presumes you are able to assign independent work.

2:30-2:35	Welcome, objectives for the meeting
2:35-2:55	Core Values/team building activity (see suggestions below)
2:55-3:00	Break
3:00-3:20	Project updates from members, assign projects for next meeting
3:20-3:40	Robot game updates from members, assign projects for next meeting
3:40-3:45	Closing, review, takeaways

The structure of your team (and consequently the work assigned to individuals) will depend on the size of your team and the capabilities of each member. Here is how I would structure a team of eight students:

1. Team Captain
2. Project Lead
    a. Research Manager
    b. Presentation Manager
3. Robot Game Lead
    a. Strategy Manager
    b. Build Manager
4. Programming Manager

Given that you probably won't all be in the same place most of the time, this will give students areas of ownership. This is not to say that students will not all contribute to the project research, but one student will be the point person for aggregating that research and assigning additional responsibilities. The level of oversight and guidance will vary based on the experience of your students.

Of the 20-minute Project block and 20-minute Robot Game block, I would recommend allowing the leads to spend a few minutes giving a general update and asking other

members of the team for any updates they have. They should then focus on assigning work to complete for the upcoming meeting.

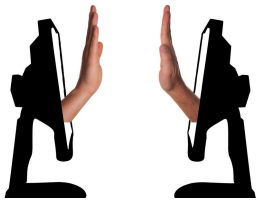
Core values/team building

Since the era of video conferencing as the new normal, lots of people with more experience than me have released their ideas for team building over video conferencing. I'll link to some of my favorites below. Please note that not every activity is geared towards FLL-aged kids, but there is still lots of great stuff in there!

- Time Doctor (https://biz30.timedoctor.com/virtual-team-building/)
- Museum Hack (https://museumhack.com/virtual-team-building-for-remote-teams/)
- SessionLab (https://www.sessionlab.com/blog/online-energizers/)

In addition, there are a few activities that I have done with teams since this has all started which work pretty well.

- **The Costume Contest** – good for one of your early meetings as an ice breaker. Give each kid 3-5 minutes to go around their room or desk and find whatever they can to make a costume. It doesn't have to be an actual costume but something creative they can use as one. Then, when they return, have them each describe what they are wearing. If you have some really outgoing and creative kids, you can ask them to make up a story about what they are wearing.



- **Random Object Challenge** – good for helping the team learn to work together and problem solve. Give each kid just one minute to find an object of importance or interest to them around their room but do not tell them what it is for. When they come back, have them each hold up their object. Then, the team must work together to determine a solution to a problem you present to them using only these objects. When interviewing camp staff, I tasked the group with the scenario of entertaining a group of kids with only those objects. You could make it more relevant to the FLL or the challenge, such as how to solve a problem related to the theme. The difficulty and level of guidance you provide are all up to you—whatever you think is best.
- **Brainstorming team identity**. There are various ways to accomplish this. Regardless, team members should be on the same page about their identity and goals. In whatever way you decide, have each student come up with one word which describes the team (either presently or as their end goal). Then, compare them. You can revisit this at a later point if the students ever get off track.

Finally, FIRST has created some Core Values activities as part of their FIRST @ Home toolkit. Check them out on the FIRST webpage and take whatever works best for your team. They

are even providing full lesson plans for certain activities.
https://www.firstinspires.org/community/home-learning

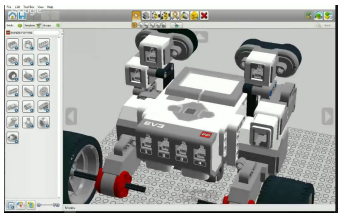
How do we work if we're not all in one place?

One of the most common questions teams are already asking is "how can we work as a team if we're far apart?" Let me start by saying: it is not going to be easy, but I am sure you are up for the challenge. I've broken up how I would tackle each of the three areas of FLL without any in-person meetings below:

The Robot Game

The robot game may seem like the hardest component to do at home. However, I think that you might find that with increasing technology, you will be able to accomplish quite a bit, even from a distance. I acknowledge that a lot of what your team can accomplish will be largely dependent on both resources and policies. If a school, for example, will not let you take robots home with you, it will be difficult for students to try and build and program from at home.

To start, I recommend designing the robot on 3D modeling software. There are a few options to use. The officially provided solution is **LEGO Digital Designer (LDD)**, a free software provided by LEGO for creating 3D models on the computer. However, LDD is no longer being updated or supported. You can still download it, but newer parts might not be supported and you won't get any further updates. When you are done designing, it can even generate building instructions. As an alternative, I recommend **Studio 2.0 by BrickLink**. This program has similar functions to LDD, but it is newer and still getting updates. As an added bonus, the software links directly to BrickLink and will help you find any part you don't already have in your inventory. Since the software is free, any student with computer access should be able to download it. You can have all your students design separate robots and vote on the best, choose individual features from individual robots, or whatever else you desire. Download Studio 2.0 from here: https://www.bricklink.com/v3/studio/download.page



I would then designate one student (or one household if you have siblings on the team) to build the robot according to the instructions that the team agreed upon. This way, even if only one or two students can physically build, the whole team is involved in the design process.

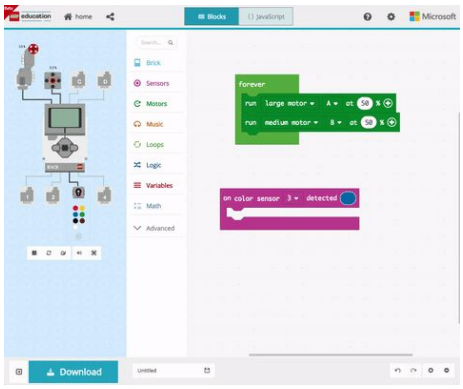
If other students have access to LEGOs at home (or if you can safely distribute parts to multiple students), those students can work on attachments and then provide pictures or instructions to the primary builders. You might even consider providing certain mission

models from the field to individual students so they can test it during the early stages, and eventually collect them back to have one full field.

Programming may be a bigger challenge than building. The actual **NXT and EV3 programming software** is available for free for educational purposes, so again anyone with a computer can have access. However, the challenge comes in with testing and modifying programs. You might get crafty and try to have one program, and another test over Zoom or something similar. If it is safe to do so, consider having the person who is the primary programmer be different from the person who is the primary builder so that multiple students can have the hands-on experience.

You will also want a storage solution for your programs. If multiple people are working on the same programs (or even if they aren't and you want a backup), you should look into cloud storage options. You can use common storage solutions like Google Drive which have built-in version control mechanisms, or you can use robot-specific software. One popular solution is **EV3Hub**. You can create a shared team workspace, and have individual programmers upload versions. Check it out here: https://beta.ev3hub.com/. I've heard that the hardest part is getting your students to remember to use it, but once they do, it should help tremendously.

There are also some amazing simulators out there for Mindstorms, which will let your students see how robots are *expected* to behave. For a while, the best (and really only) simulator out there was an expensive—but amazing—software from Carnegie Melon. There is now an official simulator from LEGO and Microsoft called **Microsoft MakeCode for LEGO Mindstorms Education EV3**. The programming language does look a bit different from the one you are used to (it is more like Scratch), but it is actually more flexible and potentially easier to follow. Your students can program online without downloading any software, and see if the robot behaves as intended. They can then download the program on to an actual robot. Access it at http://makecode.mindstorms.com. Other simulators are out there and may let you see more closely how the robot would behave on the game board, so feel free to explore other solutions.

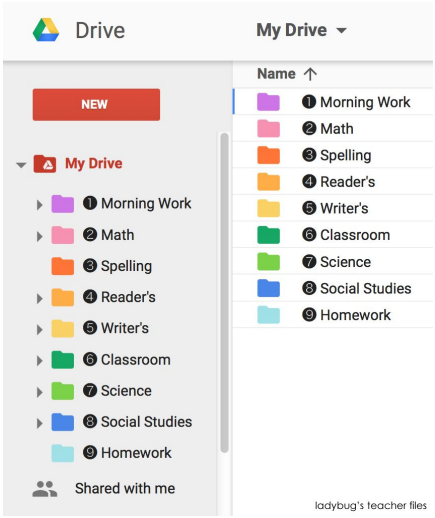


There can actually be a benefit for teams being forced to work on their robots remotely. In the workforce, engineers are increasingly on large teams in different locations. Your students will learn the skill sets they need to document their progress, communicate, delegate, and share the workload. No one person will be able to take over everything this year, and the teams which succeed will be the ones which have the best documentation and communication.

The Innovative Solution/Research Project

The project is probably the easiest component to move online. For those of you who are teachers, you can take many of the same types of lessons you use in the classroom and apply them here. The key to success in collaborating on a research project is a **well-organized, shared Google Doc** for everyone to place their ideas. Encourage students to brainstorm on their own and then report back their findings.

You can continue to interview experts, even if you cannot meet them in person. Many people will be willing to do meetings remotely. As an added advantage, if you are doing these meetings remotely, you are not just limited towards local experts. If someone in another state or country is the best accessible expert for a topic, don't be shy to reach out to them! I recommend establishing a question-asking protocol in advance to be respectful of the experts' time. You can even ask them questions over email if the timezones don't line up.



In terms of developing prototypes, you can have multiple students work on different prototypes and present either all of them, or the best one. You can also follow the robot approach of taking the best components from each and combining them. Like the robot, encourage kids to document their progress periodically.

Core Values

I am a firm believer that Core Values should be included in everything you do. I highly recommend starting each meeting (or at least many of them) with team building activities. Core Values is best learned through experience and seeing examples. I encourage you to determine what works best for your students and follow that. Not every team will need to work on the same aspects of Core Values, so evaluate where your team is strongest and needs the most assistance and build a plan based on that. Don't forget that having fun is a Core Value and you should consider that, just as much as the educational value.

How will I be judged?

This is a difficult question to answer. Judging will vary largely by region. Listen to your PDP for the most up-to-date information. Some regions will do synchronous (live) judging and/or robot rounds and others may do asynchronous (pre-recorded) judging and/or robot rounds.

If you are doing pre-recorded judging, and the rules of your region permit it, this is a great time to let kids with video editing skills show off their work! Individuals can record different parts of the presentation and you can task a student or two with putting it all together. Remember, the kids should still do the work—with the guidance from coaches and mentors.

If you are doing live video, you'll need to use whatever platform the region asks you to use. I highly recommend doing as many practice runs as possible, and replicate the technology they will be using when feasible (e.g. if they use Zoom, try to do a practice run on Zoom).

Tools and tips for remote judging and robot performance

The tools you will want and need to use can vary based on your region. Some may require you to use a specific timer, for example, while others might give you more flexibility. Here are some recommendations but remember to only use what is permitted in your region.

Timer

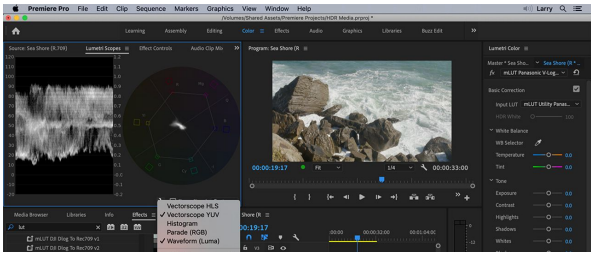
There are lots of timers out there. If you need to record 2:30 for your robot game and have a timer in the picture for easy verification, there is a resizable timer at https://hub.jaredhk.com/common/legotimer.html. It has the FLL logo on it and plays the official game sounds and colors throughout. You can also download it as an MP4 file to resize for your various devices. You can also simply search the web for "countdown timer" and find tons of great options.

Decreasing file sizes

When regions ask you to upload content, they may limit the size of the files you can share. There are lots of tools that can help with this. I recommend ffmpeg (https://ffmpeg.org/) for large files that need to be much smaller and clideo (https://clideo.com/compress-video) for files that are under 500 MB but still need to be reduced. You also may want to convert the file to a commonly accepted codec. Programs like ffmpeg can help with that, too. The most common is h265.

Video software

You will not be judged based on the production value of your video. Of course, you want it to look good, but it is understandable if you aren't using super fancy software. If you have



a Mac, iMovie (free) will be fine for most purposes. If you did want to invest in software, I personally like Adobe Premiere Pro ($19.99/month for just Premiere or $74.99/month for all of Creative Cloud) which has educational pricing available ($19.99/month for full Creative Cloud). The cheaper version, Premiere Elements (one-time cost of $99.99), is also not bad. If you are on a Mac, my choice for video software is Final Cut Pro (one-time cost of $299.99).

Once again, though, I stress that you shouldn't buy expensive software just for this. If you want to make other videos, too, and have the funds, go for it. Otherwise, stick to the freebies and you'll be fine. Also check with your school or parent organization to see if they have free or discounted software available for you.

Robot software

As mentioned in the previous section, consider robot design/modeling software such as LEGO Digital Designer and robot programming simulation software. There are lots of great options out there!

Answer all of the questions

If you are doing pre-recorded videos, it is crucial that you answer all of the questions the judges ask. In a live interview, the burden of getting the information needed to evaluate teams is on the judges (i.e. they need to ask about certain things before they can score you on them). In a pre-recorded video, though, the burden to share all of the information is on the team. You should write your presentation scripts as closely aligned to the rubric as possible. That way, you can guarantee that the judges will, at the very least, be able to fill out the whole thing. There are also common questions which judges ask (you can see examples at http://hub.jaredhk.com/judges). Try to address those in your presentation. It will be a bit of a challenge, but you don't want the judges to wish they could ask you a clarifying question. It will be harder than usual on judges this year, so try and make their job as easy as you can. If the region provides you supplemental questions, answer them all thoughtfully and completely.

Position webcams effectively

When recording via webcams (such as on live Zoom calls or when cameras aren't available), be sure to follow some basic guidelines for ensuring the picture looks good. Your camera should be at eye level. You'll want to have light directly on your face when possible, and nowhere else in the room. Natural light *can* make you look better, but it is less predictable

and harder to control. The production value certainly does not need to be professional, but the better the judges can see you (and you can see each other!), the easier it will be.

Creating your video

If it is safe to do so, you may want to film from the same location. Take extreme caution to follow appropriate local health guidelines. In certain areas, it may be possible for teams to meet even if events are being held. If it is uncomfortable or unsafe to do so, judges will understand video recorded from multiple locations.

Information for Program Delivery Partners, Tournament Directors, and Judge Advisers

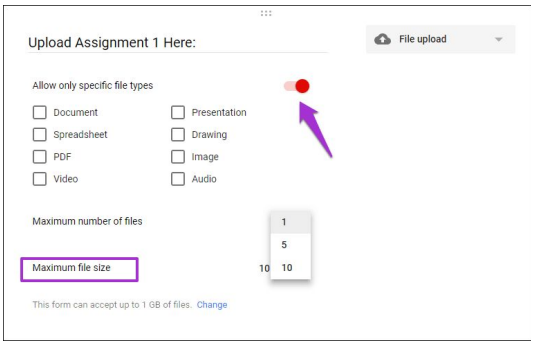
Key volunteers and PDPs should consult with official guidance provided by FIRST. If you are allowed discretion over how you conduct your operations, please see some guidelines below that may help.

Should I do live or pre-recorded judging?

This is a very difficult question to answer. On the one hand, live judging is much more conducive to the FLL format we are all used to. It is easier to judge teams when we can ask them questions. At the same time, it presents enormous logistical challenges (software and its associated costs, getting all teams to understand the technology, scheduling limitations, etc.). As a general rule of thumb, small regions or small independently controlled events should consider if live judging is feasible. Large regions which need to make decisions for all of their events and teams may need to use pre-recorded judging. One option is to do pre-recorded judging for your Qualifying Tournaments and have live for your Championship tournaments since there are fewer teams and volunteers to onboard.

How can I collect large (or multiple) files from teams?

Asking teams to upload videos to YouTube and have them marked “Unlisted” is one option, though that relies on coaches being able to follow long and specific instructions. You then will need to curate all of the responses and ensure that the settings on the video are correct. On the positive side, nobody needs to worry about storage limits in that case.



Another option is the “File Upload” feature on Google Forms which is a newly introduced feature for consumer Google accounts (i.e. a normal Gmail account). You can add questions which ask for the user to upload a file and you can even restrict the

types of files and size of them. The videos or other files will then go into your Google Drive account, and links to the files will be automatically placed in a Google Spreadsheet next to other question responses. More information and instructions can be found here: https://sites.google.com/site/scriptsexamples/home/announcements/google-forms-file-upload-feature.

Should I change the way I evaluate teams?

If there was ever a time for benefit of the doubt in FLL, this is the time. While ordinarily the judges need to be responsible for getting all the possible information from teams, if there is no interactive question and answer period, try to avoid assuming that teams did not consider a certain factor. For example, if a team does not mention the cost of implementation, you should consider that as the team not explaining the cost to you, rather than assuming the team did not do the work to evaluate the cost. Of course, teams who provide more information will likely do better in judging, but "disqualifying" teams or automatically putting them at the bottom of your ranking based on misinformation should be avoided this season.

Should I use supplemental questions?

It is highly recommended that you either modify the Team Information Sheet or create a supplement asking additional questions to the teams. If you have a standard set of questions you provide to your judges, consider picking a few of the most important ones from that list and requesting that the team submits written answers to them. My strong recommendation is to include one question for each major section of the rubric. That way, you can avoid giving out "NDs" (Not Demonstrated) unless teams simply ignore part or all of certain questions. It will be more work on the teams to produce and the judges to evaluate but will ensure the most equitable judging possible.

Where can I find specific sample questions related to a virtual season?

We have provided a growing list of sample questions in Appendix A, to be used in conjunction with your typical questions.

Should I cancel my tournament? Should I cancel the whole season?

These questions are best answered by your local health officials and guidance from FIRST HQ. Additionally, keep in mind that even if you have the green light from those entities, your normal venues may not be willing to host large events, or might be closed entirely.

Some regions may explore hybrid options, based on the size of their events, their location, and the timeline for the season. For example, maybe Qualifying Tournaments are not safe when your region typically hosts them, but a regional Championship might be. Always consult with public health experts.

What should I charge for this season?

Teams, schools, and individual families are facing financial hardship this year. If you can lower your registration costs and keep the organization afloat, it would make a huge difference for teams. It depends a lot on your financial situation (e.g. is your region its own non-profit, part of a bigger organization, operating independently, etc.). If your only costs for the season normally are venue, food, supplies, and website, I would say that you should lower as close to your estimated actual costs for this season as possible. So, if you are still ordering trophies and you need to invest a certain amount in video technology, calculate that cost and charge it to teams. If your region has paid employees or individuals receiving stipends, or if you need to pay dues or administrative expenses to another organization, your costs will vary.

Frequently Asked Questions

Is my region going virtual this year?

In order to find out if your region is virtual, visit your region's website or contact your PDP. You can find your partner's contact information by going to https://www.firstinspires.org/find-local-support.

Did the requirements for submission change this season?

If your region is going virtual or otherwise modifying their season, it is likely the requirements changed. Visit your region's website or contact your PDP. You can find your partner's contact information by going to https://www.firstinspires.org/find-local-support.

Will there be a new challenge this year?

FIRST has announced a new game called FIRST RePLAY. More information is coming by August 4th.

Is it safe for my team to meet?

If you are a school team, you should follow the guidance of your school. If school is in session and extracurriculars are permitted, follow the appropriate guidance for safe meetings. If you are a community-based team, please consider public health guidance from your local and state health officials and always exercise judgment. Teams which are made up solely of siblings or other individuals living in the same household should be able to meet in person unless it otherwise violates public health guidance.

What projects can I give my students to learn at their own pace?

Once the season starts (early August), I recommend providing structured, tangible assignments. By this I mean that all work after the challenge is released should be directly towards the challenge. If you are looking to engage your students and prepare them before August, there are a number of projects they can take on. First, they should familiarize themselves with the software you decide to use (such as Studio 2.0 or a simulator). Each of the software programs I recommended have at least some type of tutorial on their platforms, and students can do those on their own pace. They should even familiarize themselves with a video-conferencing platform if they are not already. There are also other lessons, like those from FLL Tutorials, which will provide students something to learn. If you want to meet regularly, you can even have them redesign robots for last year's game using the software since they are more comfortable with the game as it is now.

What do I do if I have more questions?

This list of questions will continue to be updated as I receive them. Please contact me at jhasenklein@gmail.com and I will be more than happy to answer your question in email and in this guide to the best of my ability. For the most up-to-date information about your region, contact your PDP.

Appendix A - Sample Judging Questions

These questions are recommended additions to your standard list of questions, intended to be asked if doing synchronous judging or presented in a written questionnaire for asynchronous judging.

- What challenges or obstacles did your team overcome this season?
- What is one thing you learned by not working in the same place?
- What skills do you think are most important for working as a team remotely?
- How do you ensure teamwork when so far apart?
- What does your team do for fun in quarantine?
- How has your coach provided you guidance remotely?
- Have there been any benefits to changing the way your team operates?

This list is evolving and will be updated periodically.