

Frequently Encountered Situations in Officiating

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Advice for the new judge or referee

- **In Summary**
 - Have Fun!
 - Make sure the kids have fun!
 - Be consistent!
 - Be respectful!
 - Ask questions if you are unsure!
 - Keep up, it's fast paced!

- **FUN** -- this is the culmination of a lot of work by the team, be sure they leave with the best experience WE can give them / sometimes they fail in their solution or missions but doing the best they can and have on the given tournament day is most important AND we hope to see them back next year or at State tourney
 - It is fun for the officials.
 - Don't lose track of the element of fun.
 - Make sure you are having fun, because if you aren't, the kids won't.
 - Engage the kids in conversation before performance runs so they can relax.

- **Be fair. Be consistent.** Playing field MUST be level for all teams. As head ref, I tell them to consult me if they have a difficult call or situation. As I circulate I see most performance runs and often see the tough call the ref has to make. Sometimes they call out to me to come to their table and see the issue. I depend upon the ref to make a call and I tell them they "were there" and I will support them. If they are unsure, we rule in favor of the kids.
 - You can't be the perfect judge, but you have to be a fair one.
 - Make sure you are consistent. If you're in doubt about something, don't hesitate to get the head ref/judge.

- **Don't be afraid to ask.** There are many rules, interpretations, edicts, etc. and sometimes how we have been ruling may not be exactly as written in the rules. Ask, ask, ask. Refs need to be confident in their understanding and consistent application of the rules to maintain the level playing field for all.
 - It is fast-paced, so keep moving and don't think you will be going back to catch up.

- **Be Respectful.**
 - They are kids, some doing this for the first time, so don't put them on the spot.
 - Treat the kids with respect, since they've done something special by competing.
 - Compliment them on something they have done on their poster or skit or robot design. Some teams are very unprepared, especially rookie teams, so a boost of confidence is never wasted.
 - The kids take your word very seriously, so be careful of what you say, and make sure their experience is positive.
 - Giving the kids an over view of what you are judging and how much time they will have, helps break the ice.

You are not sure the kids did all the work. What do you say or do?

- I asked "how" questions. Explain to me how you figured out the solution of using two wheels. How did you decide what to do first? Or I would pick up a few specific kids and ask them what they did.
- Ask them specifically.... "Which one of you did this part... who did that part....what part did you build...."
- This has to be the toughest one, since make-or-break help can come on two levels.
 - The first level is whether adults built the vehicle and the kids are just there to show it off. If this happens, then the kids aren't going to understand the vehicle very well. This should come out when you try asking them about why they gave the robot various features.
 - The second and harder level has to do with innovative ideas. If the kids did most of the work behind a really clever idea, then they probably synthesized it from several sources, probably including their coach. But they should be able to identify aspects of it that came from several sources: the Constructopedia, a car they saw the previous season, something from the Internet, etc.
 - However, you can't dismiss a team as unoriginal or coach-driven simply because they identify their coach as a source of ideas. If the kids built the vehicle themselves (as opposed to being directed by the coach) then it shows they understood both the problem and the clever idea pretty well. It's never enough to have a clever idea - you also need the creative, problem-solving smarts it takes to make the idea work in practice.
- Probing questions like how many variations did you make or do? Why did you design this aspect...? How did you select order of tasks you would run on the performance table?

One kid seems to answer all the questions. How do you get the others involved?

- I would directly ask each kid what they did. In judging Team Award this was very important, because there usually is one kid (or two) who like to talk and will monopolize the situation if you don't direct questions to other kids.
- Direct your questions specifically towards the other kids. I've even said, "Okay, you have been answering all the questions, so now let's hear what some of your teammates have to say."
- You double-team them. You generally have 2 or 3 judges, so one draws off the talkative one while the other tries to get answers from the other kids. Often the other teammates are just dying to get a word in edgewise.
- Another approach is to make it clear that you want answers from other team members. This has to be handled carefully, of course, since you don't want to put down the talkative one.
- I usually ask one or two questions to each individual kid. Same question to each to give them a chance to say something. Example: what was the hardest thing about working on a team? etc.
- Turn and address the others / ask if anyone else besides "Johnny" work on the solution / ask what each member learned as they went through the solution

The kids give one word answers. How do you involve them?

- I worked with another judge who did a great job with the teams who had nothing to say. She was judging Presentation. If the kids obviously had nothing to present, she would talk to them about research and forming a hypothesis, and engaged them in learning what they should have done without saying 'this is what you should have done.' She really made the time worthwhile for the team, rather than dismissing them as unprepared.
- Ask them to explain their answers... "What do you mean by that?" or "Can you explain that to me better?"
- You have to get the ice broken, so focus on that first and worry about collecting important information next. There's always some aspect of Lego League that one or more kids feel comfortable talking about. If there's obviously something they should feel proud about, start with that, even if it's a peripheral thing like the team t-shirt design. Ask questions they can easily

- answer but might need lots of words, like how the team got started, or to describe what happens during a team meeting.
- I ask them a more detailed question. Something they would have to respond in more detail about. Example: What did you learn about Mars that you didn't know before? Again, ask each individual kid.

How do you word constructive criticism or suggestions?

- I always wrote "congratulations on figuring out....." whatever they did well on or I found something, anything I could find if it was a weak team. I always congratulated them on some accomplishment.
- Try to word things as questions so that the kids identify the problem area themselves in their own words.
- I ask what improvements they could do for next year. Or if they would try to incorporate more details in their research project or more difficult programming for their robot.
- **First** let them know they have accomplished a great deal of successes to this point / try to suggest that they think about why they did a task in the manner they did / allow them to develop their own solutions.

Techniques to relax the kids.

- First thing I do is introduce myself and ask them if they're having fun. The next thing I do is ask them who the best referee is, and give them hints if they can't figure it out! :-). That usually gets a few laughs. I also make sure they know that if things go wrong, they can always pick up the robot and bring it back to base. For kids who are especially nervous, I usually tell them to breathe in and breathe out, and I make an exaggerated demonstration of it with them a few times.
- I get down close to their height level, perhaps on a knee, let them know "we have time" / back them away from the table a minute to compose themselves / let them decide who's hands can work best to rebuild (this is a highly charged, nervous time for them) / prevent other team members from criticizing / let them know we can get it put together and run (unfortunately sometimes the robot "explodes" and no amount of time can rebuild at the table) / possibly solicit comfort from the team manager
- As a Roving Teamwork Judge at State, I had a unique opportunity to observe and interact with the teams in their natural habitat - their pits. One team that I visited was taking a break from the day's activities by sitting in a circle on the floor telling jokes, so I sat on the floor and joined their circle. After we loosened up with everyone telling me their favorite joke, they were relaxed and going a mile-a-minute with information. Another team was spraying their hair with orange hair spray in preparation to do their presentation skit when I got to their pit. They asked if they could spray my hair as an "initiation into their tribe". I let them, and after that they felt relaxed and at-ease with me. I guess the moral of the story is that when the teams saw me as an equal they were better at giving information than teams that saw me as a scary judge.

Dean's guide to technical judging

PREPARATION

 You should begin your judging homework several weeks before the competition. Look at some of the robot pictures posted on the web site. Try and familiarize yourself with the various robots in the RIS constructopedia. Take a peek at any other LEGO Mindstorms books you can find.

Bring a digital camera to the competition. It is the fastest and easiest way to take notes.

Get all your paperwork done prior to the start of judging. This includes not only filling out the team names and numbers on the judging sheets (hopefully there will be labels with this info available), but also put your

initials on each form. I also prepare a notepad for my own comments. I place each team's name at the top of a sheet in the order that the teams will appear. I then interleave the judging forms between the pages in the notebook. Every bit you can do ahead of time helps!

Visit the pits area before the competition starts. You don't have to see robots you will be judging, but seeing 10-20 robots should give you a good idea of what the competition is like. Use this information when scoring your first team. If your first team looks very strong compared to what you saw, give them 80-90% scores. If your first team is weak in comparison, start around 50%. Even though it's all relative in the end, it is better for egos to score a little higher.

If you can't visit the pits before competition, wait until you've seen two or three teams before you assign any scores.

When judging, I keep notes on two different pieces of paper. I immediately write all positive comments directly on the score sheet. Negative comments or memory aids go in the notebook. Scores always go in the notebook until I am sure that they are ready to hand in. You don't want the team to see that somehow they got scored down 3 points from your initial impression.

THE JUDGING SESSION

Start each judging session with a description of your expectations. This gives the teams a framework to build on. For example:

"Are you team *****? This is technical judging, and we will be looking at the design and programming of your robot. I'm most interested how rugged your robot is designed and how well it completes its missions. Fred is interested in creative ideas you came up with for completing the mission objectives, or for correcting any problems you had controlling your robot. Sue will be taking an in depth look into how you programmed your robot."

"Why don't you start by demonstrating your robot capabilities. Run it through a few of the missions, and make sure to point out any special features that help your robot to complete the missions successfully. Fred, Sue and I may interrupt you occasionally to ask questions or clarify something. Otherwise you run the show."

The programming judge may chime in then and mention that after a few minutes he/she will take a few team members aside to look at the programming.

Only allow the team to demonstrate 1 or 2 missions before you start asking questions. Try to make the questions pertinent to the mission just completed. Try to use open ended questions. For example:

Let's say that the team has just demonstrated a mission where the robot follows along one of the walls using a wall-follower made from a wheel mounted on the side of the robot.

Q: "What is the purpose of the wheel on the side of your robot?"

A: "We use that for following along the wall?"

Q: "What happens if you don't have the wheel there?"

A: "The tires would rub against the wall and sometimes the robot would get stuck."

Q: "How did you come up with the idea of the wheel?"

A: "We saw it used on some robots last year"

Try to follow each exchange with a complement and a little bit of education. Be careful though, don't condescend or be a blowhard. The wall following exchange above could be followed up by something like:

"That mechanical wall follower is a pretty good idea. I've seen them used before on maze running robots. Sometimes a touch sensor is added so the robot knows if the wheel is touching a wall or not."

Make the judging session really interactive. Don't stand on one side of the table while the team presents from the other side. During judging, move around the table to get different views of the robot. This gives you an excuse to infiltrate the team. Use these opportunities to ask questions of different team members. Don't allow just one or two kids to speak. Work hard at being interested in what each kid says. They worked hard and deserve all our attention.

I don't worry much about determining if the kids did the work or not. If you ask everyone in the team at least one or two of these questions the team dynamics become pretty obvious.

Don't worry about offering suggestions for improvement. Try leading the kids to the suggested solution through the use of leading questions. For example:

Let's say a robot cannot complete a mission reliably. Sometimes it runs into an obstacle and must be retrieved, incurring a penalty. This becomes obvious to you as they attempt to demonstrate the mission.

Q: "Your robot ran into the satellite launcher on the way to the habitation modules. Does this happen often?"

A: "Yah. We have problems making it go in a straight line, and sometimes it doesn't turn the right amount."

Q: "That's a pretty common problem. Even if when you give the same speed command, any two LEGO motors usually run at slightly different speeds. Have you tried any ideas for fixing this problem?"

A: "We lowered the motor speed on the right motor, and that made it go straighter, but the turns are still not always good."

Q: "How are you controlling the turns?"

A: "We spin the wheels in opposite directions until the rotation sensor sees 16 counts."

Q: "Sounds pretty good. Rotation sensors are better for measuring wheel travel than using the internal timers. Glad to see you're using them. If the rotation sensor is accurate, why aren't the turns repeatable?"

A: "We don't know."

Q: "Have you looked at what the sensor is reading after the robot completes the turn? Sometimes the robot will travel a pretty long distance after you shut down the motors."

The important thing is to keep them involved in the discussion. Don't lecture.

Offer some praise at the end of the session. Try really hard to make it sincere. Never belittle their accomplishments, even if you think no one is around to hear.

I have been very lucky in being involved in FLL for a long time and participating in so many tournaments. Some of these kids I have seen 4 or 5 times now. Whenever possible, I try to mention that I remember their earlier robots. It goes over really well with kids when they see you care enough to remember what they were doing last year.

DIFFICULT GROUPS

Sometimes I'll get a pretty reticent bunch of kids that require more prompting before they open up. When this happens I start asking lots of really easy questions just to get them to talk. Some of them are really inane, but they seem to work.

"Does your robot have a name?"

"How well have you done in the competition round? What's your best score?"

"What kind of scores do you expect to get in competition?"

"How many of the missions can your robot complete?"

"What's the coolest thing about your robot?"

"What was the most fun part of being involved in FLL?"

"Did you have any robot experience before this program?"

"Did you have much experience with LEGO before this?"

"What have you learned during this program?"

I slowly graduate to more difficult questions if this works well.

"Why did you decide on this robot configuration? Did you try any others?
How did you decide which design worked best?"

"Do you know the common name for this type of robot?"

"What kinds of problems did this robot solve?"

"What problems do you still have with your robot?"

"Do you have any ideas on how to solve your existing problems?"

Sometimes I run into teams with a (sometimes self appointed) spokesman. When this happens, make use of the fact that there are three judges. Allow one judge to engage the spokesman while the remaining two interrogate the remaining team members.

Sometimes a team brings very little to the table to judge. The robot is simple, they didn't spend much time or effort on it for some reason, and they don't really want to be where they are. I get about two of these teams a year. Resist the urge to teach Robot Building 101 in 10 minutes or less. They won't appreciate it or get much out of it. Just ask as many questions as you feel comfortable with and cut them loose. Use the extra time to catch up on filling out your score sheets.

TRAGEDY

At least once every year I get a team that appears at the judging table with a box full of loose LEGO parts because the robot fell down. Or else the robot won't complete any of the missions because the programs are all gone. How do you handle such a situation?

If things appear utterly hopeless, dispatch one of the judges to find Ted. Maybe the team can be rescheduled for judging later.

If that doesn't work, it's time for a little imagination. Examine the intact structure and ask questions. Ask what the plan is to complete each mission. Ask what features of the robot aid in completing the missions successfully. Discuss strategies for preventing such a disaster from happening in the future. Allow the team to leave early so they can prepare for the competition table.

THINGS TO LOOK FOR IN ROBUST DESIGN

I always look at the complexity of the drivetrain. Lowest scores are given to robots that can only travel in a straight line. Such a robot may be very successful at performing most of the missions, but are incapable of completing them all.

After determining that a robot is theoretically capable of completing all the missions, I try to gage how reliably it could do so. I give lower robots that are extremely dependant on initial conditions. I may not decide to penalize the team if they use special fixtures on features on the robot to make it easy to reliably place the robot in the correct starting position.

I give high marks for sensor use, as long as the sensor is used in a reasonable manner. I will give a high mark to a team that tries to use a sensor, integrates it properly in their design, but fails to benefit because they have problems programming it. I don't reward points if the sensor is used in such a way that it cannot provide any benefit. An example of this that I commonly see is the use of touch sensors for collision detection without any kind of bumper to close the touch sensor contact.

I give high marks to teams that don't rely completely on odometry (determining where they are by measuring wheel motion). Line following and wall following get big bonuses. Bumpers for identifying obstacles are a big plus. If a team uses sensor information to compute where they are on the competition mat they deserve huge points.

Don't confuse innovate and robust design. Clever ideas that don't work well should not raise a teams robust design score.

Look at how the wheels are mounted on the robot. Does the robot sag under its own weight? Do the axle's bend? Is there excessive friction in the drivetrain? Is the robot statically and dynamically stable (where is the center of gravity). Is there adequate clearance to drive over obstacles?

How well does the robot hold together? Bracing is a good way to hold a robot together, but there are other techniques as well. Don't penalize a team that only uses "stap-on" connections if they are adequate for the job. Excessive bracing may only add weight, without providing any real strengthening.

Mark and Todd's Guide to Research Presentation Judging

Set up

I'm usually writing notes on the last team when the kids file in, so I tell them there is no rush, and to set up. I rarely interfere with the parents/coach help at this point. I make sure the team sets up to present to the audience, rather than to the teamwork judge and me. I also ask whether the kids approve all the cameras I see in the audience. I try to get them to laugh, so they relax.

In the same vein, another second to Todd's point about finding a way to put them a little more at ease before they start.

I give little or no leeway on time for technical problems involved in setting up a digital presentation, certainly if that's all we get---this is supposed to be interactive. No extra points for cool powerpoint transitions, titles, music, et cetera and ad nauseam. Lots of extra points for good models, diagrams, skits, etc. It would probably be good for the coaches to know that technical problems and too much emphasis on getting the transitions the way they like them have significantly detracted from scores we (I, anyway) have been able to award, because those things cut into time that could have been better spent, both in preparation and in the presentation. If it was up to me, I'd ban any computer-based presentation. {Fred's editorial comment: not an unreasonable request but not likely either}

Asking Questions

Be careful how you phrase your questions - you are dealing with kids, and they can sometimes be literal. There was one team of maybe 12 young girls. They had done a video, but didn't really get the concept of the research project. I have a few standard questions that I use to try to get some excuse to give the kids points. Properly phrased, one such question is, "What would be the most difficult question I could ask you about the research project?" I usually get great answers from the kids, particularly from the kids in the back of the cluster. Unfortunately, in this case I instead asked, "What is the worst question I could ask you?" Well, one of the kids came up with a really bad, worst case, highly inappropriate question. Sigh. {Fred's editorial comment: Needless to say, it left the judge speechless, an extremely rare occurrence. Another caveat with kids taking questions literally, a technical judge asked a kid if their robot was robust enough to withstand dropping it. Kids said, "dunno, let's see" and dropped it. It broke into a million pieces. We don't recommend asking that question}

I always ask about research sources. If the kids hand me a journal, I flip through it looking for a bibliography. Lego League web sites don't count. Scientific, engineering, library, and government web sites do. The rest are in between, and I ask kids about what they do to resolve conflicting information. If they haven't seen conflicting information, I usually worry about the depth of the research they did. Books are interesting, but I've caught a few teams that brought in a bunch of books, but never actually read them. I usually do a round-robin and ask each kid what they learned.

I ask the kids questions about what they show me - if they have a graph, I ask them to explain the features to me, and then to interpret it. I try to learn the limits of their knowledge and comprehension, based on what they show me, so I can assess 'knowledge.' I usually have to judge several teams before I can set high and low scoring limits.

It really helps to have some stock questions written down and sitting in front of you at least the first few times and frequently thereafter. The questions in the presentation judging training material from last year are not perfect, but wouldn't be a bad start. Fill in by comparing with the evaluation areas on the judging form. The reason this is a good idea is that it is very easy to get led down an interesting by-way in their project and forget to ask about some other aspect of the research, like who did it and where and what their

sources are and what questions they still didn't find answers to and so forth. Your time is really limited, and it can be a real push to cover all the different aspects we're supposed to evaluate.

Asking about cost, materials, transportation difficulties, and other practical issues was a real differentiator last year, between kids who had dug into how you would actually build something, and those who stuck to deciding on what color to make their inflatable habitat.

Open questions ("what issues couldn't you find answers for?") is another good one.

Questions that get progressively harder if they can handle the easy ones are a good way to set up a range of scores. Most kids knew Mars was a planet. Fewer knew how far away it was, and roughly in what direction. A few knew something about why the environment there is as it is (gravity, temp., UV flux, atmosphere, etc.) and had thought about some of the implications. More than one team knew that Martian gravity is lower than on Earth, and also "knew" that that was because it's farther from the sun...
{Editor's note- please note the quotes around knew – this is sarcasm. The author is aware of the physics of gravity}

During the question & answer time, the only thing I let parents/coach do is help tear the set down, and to discipline kids if necessary. If the coach tries to answer a question or inject new material, I usually at first blankly stare through the parent/coach, and then if it continues, I remind the parent/coach that this is about the kids, not them.

Make sure to ask each of the kids individually 1) what they did and 2) what they learned. I also make sure I'm getting answers from a range of kids for the other questions, though the teams do frequently include specialists ("Amy did all the research on habitats.") and it's reasonable to allow for that.

If the kids have created something interesting, hop up and go look at it after their presentation, and ask questions about who did it, where they got their ideas, and what was difficult about it.

Wrap up

Thank them for doing the presentation and tell them they did a good job, especially if they actually did. It's a scary thing to do, for a lot of them.

We usually ask the kids to put the room back the way it was on the way out, too.

Scoring

Strongly second the comment about needing to hang onto the first few presentation evaluations to establish a range.

Remember that you are constantly looking for reasons to give the kids points. You are not there to take points away.

Teamwork Insights

From Kids

- "My favorite part of teamwork is learning how important it is to communicate."
- "I learned that you can disagree with your teammates, but you can still be friends."
- "I learned that sometimes my idea might be the best one, but it's more important to do what the team decides to do."
- "I learned that other kids can have good ideas too."

From Coaches

- Teams overwhelmingly rated 'pizza' and 'food' as huge motivators.
- Left pretty much alone, teams tended to focus on doing something pretty (painting their rockets and applying beads) or dangerous (launching projectiles, or experimenting with how high rockets really can fly). A facilitator and task-master helped them focus on completing milestones.
- Left completely alone, the teams degenerated into chaos. Process and guidelines were important to set boundaries.
- Changing a person's mind, once that mind is made up, is difficult. Changing a team's direction once that direction is established by the team, is incredibly difficult.
- Adding new kids to a previously established team was remarkably difficult - the new kids didn't seem to integrate without external facilitation.
- Openly appreciate the contributions of your team members. Help them celebrate their progress. If you revel in even small successes, your team members will be better able to make it through tough times.
- If you keep a positive outlook, laugh at yourself and find humor in the smallest details, your team will be more successful overcoming problems. Remember that all kids have bad days. Give them room to shrug off a bad mood and recapture a positive attitude.

From Judges

- Kids: "We had great teamwork. We love working as a team. We never fought."
- Judge: "Have you actually talked to each other during the previous few months?"
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- Judge: "What process did you use to make decisions?"
- Kids: "Rock/paper/scissors. It works every time."
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- Judge: "Did you always get along?"
- Kids: "Yep, we always got along. Except for when we argued about a decision."
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- Judge: "What did you find to be the hardest part about working as a team?"
- Kids: "Umm...actually working as a team."
- Kids: "Well, it was kind of hard to talk to each other. And to make decisions as a group."
- In order to stop one of the team-member from talking, every time he began to say something the rest of his team would take turns pulling him backwards by his shirt. It didn't actually stop him from talking, but it appeared to make them feel better.
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- Judge: "Have you ever had any problems working together?"
- Kid: "'Someone' had ignored some really good ideas that 'Someone' else had" Then glares at her team-mate.
- Teammate: Shrugged it off
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- One Kid: Was doing all the talking..
- Judge: "Maybe one of the others has something they'd like to share?"
- Same One Kid: "Yes, Joe was saying just the other day ..."
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- Judges and Kids: Discussion on how they worked things out and in what ways their coach helped them
- Kids: "No dummy, we're not supposed to tell them that!"

From Dilbert

- Facilitator in training meeting: "I have the results of the employee personality type preferences."
- Dilbert: "Remind me again of why we are doing this"
- Facilitator: "Your teamwork will be better when you understand that you have different styles of thinking."
- Facilitator: "For example, Dilbert prefers to use logic to solve problems."
- Facilitator: "But Randy relies more heavily on morals and values to solve problems."
- Dilbert: "That sounds like a fancy way of saying Randy is an idiot."