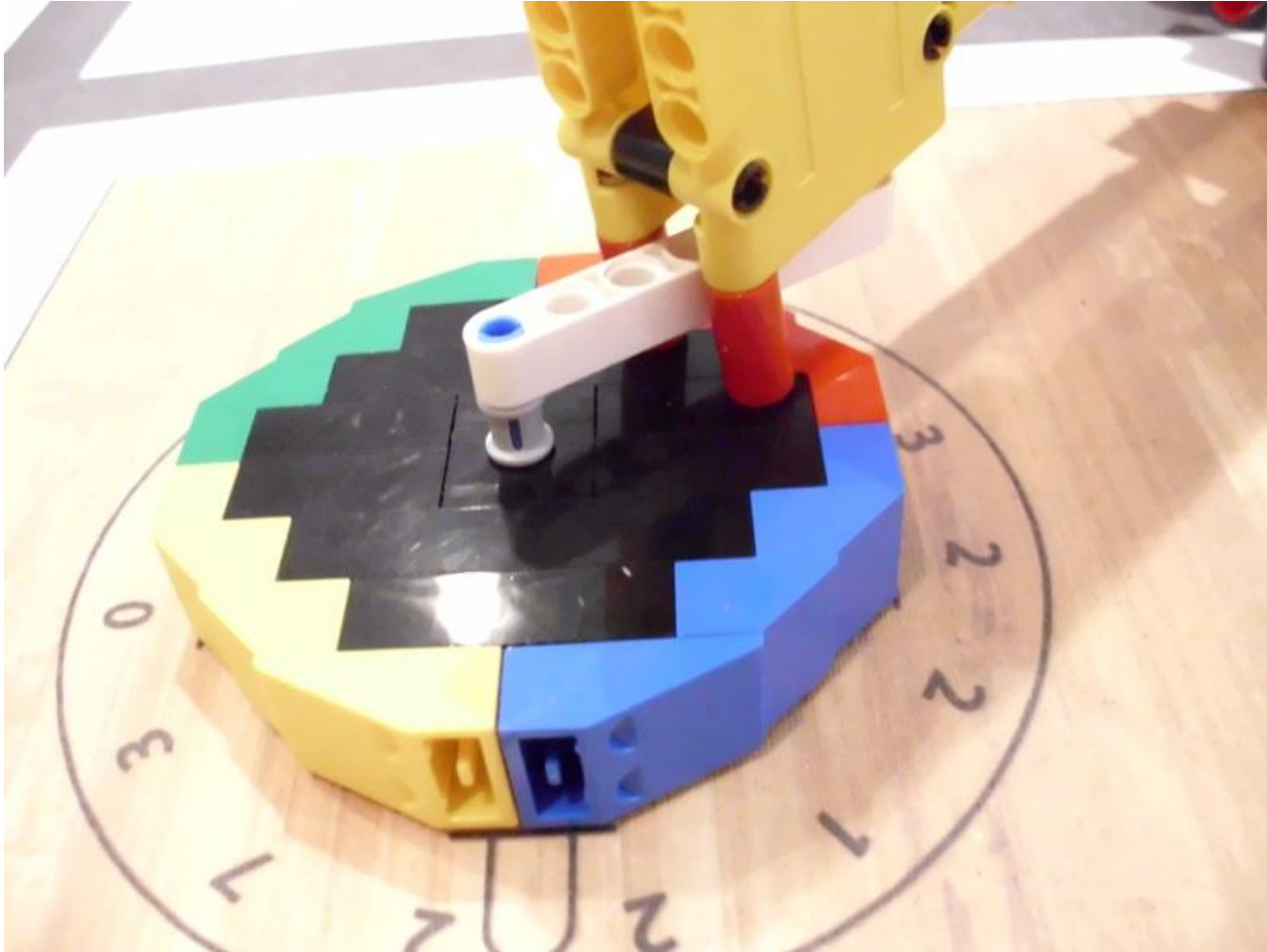


BEFORE & AT THE FLL TOURNAMENT



BASIC SEASON SCHEDULE

- Before challenge announcement
 - Build table
 - Build mission models
 - Build preliminary robot
- First team meeting – parents & kids
- By week 4, lock down robot design
- Last two practices before tournament
 - Put together master program
 - Drill, drill, drill running the robot
- Regional tournament
- (With luck) VA/DC FLL Championship

BUILDING TABLE



- KEY POINT: Attach second 2 x 4 along north wall. Attach a short "shelf" to middle of second 2 x 4.
- Reason: Competitions will have two tables that abut each other along their north walls. Each year there will be one or more mission models that will straddle the two tables. It is important to have these mission models rest exactly like those in competition.

BUILDING MISSION MODELS

- Don't dedicate a practice to building the models after the challenge is announced. There is just too little time to get ready for regionals.
- Best to build the mission models before the challenge is issued, ideally as a pre-season teambuilding exercise. If this isn't possible, build the mission models yourself.
- Prior to building, separate the parts by types and color before the team comes. This will make the building process go much faster.

TEAM MEETING TIMES

- Team meeting times will obviously be based on what works best for the coaches.
- What worked well for Sea Monsters were 3-hour practices Sunday afternoons. Team members were allowed to come one hour early to work informally on their missions.
- In addition, we usually had once-a-week 1-hour sessions with just a couple of team members to concentrate on specific problems.

FIRST TEAM MEETING – PARENTS & KIDS

- Lay ground rules for practices; finalize meeting time.
- Play FLL videos to introduce FLL and research (2011 FLL video by Inventioneers was superb).
- Get money for FLL fees, tournament fees, robot, t-shirts, etc. Recommend an extra \$50 - \$100 for Lego components, reference books and materials.
- Ask for parent volunteers to help coach research, teamwork and table.
 - Ideal is two on table and two off.
- Get consent & release forms signed.
 - Make at least two copies (one for regional & one for VA/DC).
- Sign up schedule for snacks.

FIRST TEAM MEETING (continued)

- Remind parents that team members must be on time. If they will be more than five minutes late, parent must call ahead.
 - There is just too little time to prepare for the season. Not having the full team at the beginning to discuss challenge is detrimental to team's performance.
- Have a short discussion on core values (see next two slides).
- Introduce challenge and get going.

CORE VALUES

- “Gracious professionalism” is the most wonderfully succinct vision of how we should interact. It makes FLL stand out.
- KEY POINT: At every team practice, ask what does “gracious professionalism” mean and ask for examples. Why?
 - Emphasizes importance of core value.
 - Gets each team member used to answering, so that when asked at a tournament, every team member will shoot his or hand up. This matters in scoring of events.

CORE VALUES (continued)

- Remind them that coaches, teammates, parents, competitors and referees all must be treated with respect at all times.
- Hold firm that this is one rule that cannot be broken and team members can and will be dropped at any time if broken.
 - At 2009 regional tournament, one Sea Monster spoke disparagingly of other teams during teamwork competition. He was not allowed to compete at VA/DC FLL Championship.
 - At a VA/DC FLL Championship, one of the assistant coaches was unnecessarily and frequently harsh in criticizing one of the team members. The assistant coach was not invited to return the following year.
 - On the positive side, at the 2010 VA/DC FLL Championship, a scoring error gave Sea Monsters an undeserved top score. Team members went to the head referee and got it corrected, causing a drop to second place. Team agreed that it was the right thing to do.

TYPICAL TEAM MEETING AGENDA

- Typical Sea Monster meeting agenda:
 - 10 minutes in the beginning to review the various mission problems and strategies. Review weekly Q&A updates. The first couple of meetings, this process will last considerably longer, but every team member needs to know missions thoroughly.
 - Split off half the team to do teamwork or research. Split the remaining half to work on missions with the two robots.
 - At halfway mark, snack time. Very good for relaxing and team building.
 - After snacks, switch to other half of team to work on robot.
 - Sometimes at end, spend a few minutes on full team teamwork problem or discuss research as a group.

LOOKING FOR LOOPHOLES

- Team meetings should begin by reviewing the wording of the challenge in minute detail. Make sure that every team member knows exactly what can and can't be done.
- As stated in the official FLL 2011 challenge: "Robot game text means exactly and only what it says, so it should be taken literally whenever possible... There are no hidden requirements or restrictions, but there are hidden freedoms, and you're encouraged to find them!"
- What if the game text is ambiguous or contradictory? Feel free to email VA/DC FLL Head Ref (Steve Scherr) or FLL robot game designer (Scott Evans) to clarify. They're both great at responding quickly.
- If you found a legitimate loophole, does gracious professionalism require you to share with your fellow coaches? Heck no, this is a legitimate competitive advantage.
- HOWEVER, if this loophole is not obvious and will cause confusion with the table refs, this can cause scoring confusion. Solution: Seek out tournament's head ref at the beginning of the tournament to explain what your robot will be doing and why. Bring documentation.

TWO ROBOTS

- KEY POINT: Buy a second Mindstorms NXT kit.
- During team practices, most efficient to attack two missions at the same time, assigning one robot and 2 to 3 team members to each mission.
- Allows trying out different robot designs. By week 3 or 4 in season, robot designs need to be consolidated and two robots made identical – other than color. Color differences are used to identify robots.
- Should one mission act erratically, can switch to second robot to rule out robot as cause.
- Before tournament, team must choose which robot performs more consistently and train on that robot.

FINALIZE ON ROBOT DESIGN CHOICES EARLY

- KEY POINT: No later than week 4, the basic robot design needs to be decided.
 - Wheel selection and spacing of wheel motors
 - Light sensor locations
 - Arm location (left or right, high or low)
 - Attachment points
- Why? Even small changes to robot design can profoundly affect the mission programming.
 - Late in Sea Monsters' first season, team discovered that robot did not go straight consistently. An entire practice experimented with different wheel types and standardized on large lawnmower wheels.
 - Team had a near riot when they realized that they had to modify all of their mission programs.

COACHING STYLE

- FLL's primary goal is to get kids excited about STEM (science, engineering, technology & math).
- Building a robot that succeeds in robot performance teaches real engineering concepts:
 - Problem solving
 - Programming
 - Robust hardware design
- So the role of a coach is foremost to be a teacher, where FLL is teaching by doing.
- Kids should do all of the programming and handling of the Lego pieces.

COACHING STYLE (continued)

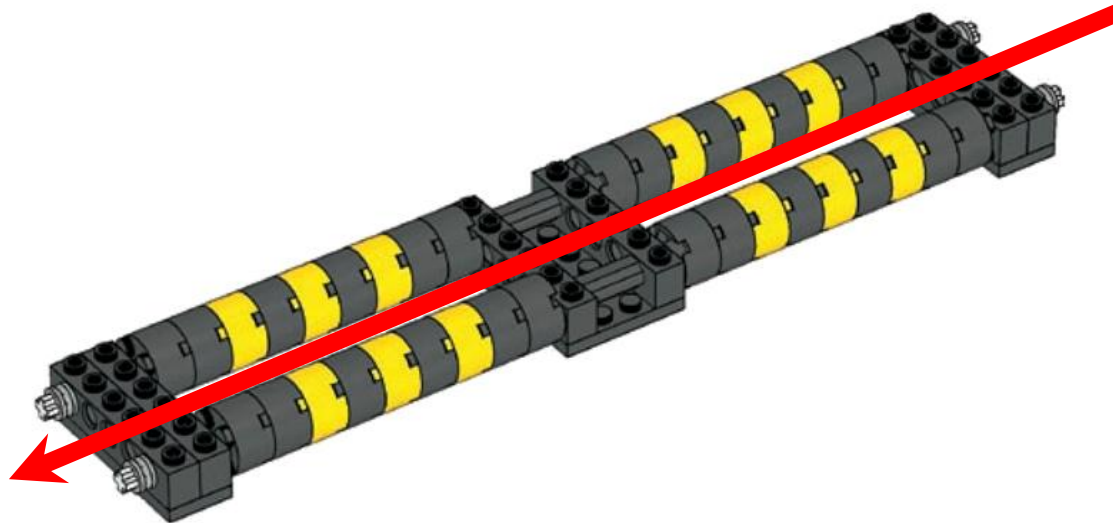
- However, this doesn't mean just letting the kids do whatever they want.
- Coaching is focusing the kids on solving the mission problems. Ask lots of leading questions. Suggest different approaches. When a mission is running imperfectly, ask why the robot does what it is doing and ask how it can be improved.
- If the answer isn't forthcoming, suggest the answer and talk through why it could be true. Talk through the tradeoffs of different approaches. Ask how to verify answer.

COMPETING DESIGNS

- A great way to stimulate ideas is to have a competition to solve a particular mission. For example, design an arm attachment that gathers mission pieces.
- Run the designs and have an open team discussion of which performs best and why.
- Select the best design or merge elements of the best designs, and then work as a team to improve it until the design is complete.

LEADING QUESTIONS

- In 2009 Smart Move, accessing rear scoring area required crossing a dynamometer – two spinning cylinders that easily trapped the robot wheels.
- Coach John Barrett asked if the robot could cross length-wise. Sure enough the robot could, which was an unusual solution for the competition.



ATTENDING EARLY TOURNAMENTS

- KEY POINT: If your regional tournament is not the first of the year, visit another tournament.
- Why? So much to learn:
 - Rules change every year and are easy to miss. A couple of years ago, the mat was moved from the southwest corner to center along south wall. Sea Monsters missed this change, but caught it by coaches visiting an early tournament and had time to adjust programs.
 - See if mission models are placed differently on mat than what you have done on the practice table.
 - See where objects may be stored immediately outside of base.
 - See if a chair is placed next to table for team to use in storing attachments, etc.
 - Get new ideas on how to approach missions.

JUDGING AT OTHER TOURNAMENTS

- Only robot performance competition is viewable by the public. It can be a real mystery what the judges look for, how other teams approach the competition or how relatively good your team is or isn't.
- **KEY POINT:** Volunteer to judge at other tournaments to get smarter on non-robot performance competitions.

STORAGE CONTAINERS FOR ROBOT & ATTACHMENTS

- KEY POINT: Buy a dedicated storage container for carrying the robot to competition. Why? It is so easy to drop or mishandle robot when off the table.
- Contents should just be robot, charger and reflash cable.
- Put towel on bottom to keep robot from moving around.
- Buy separate container for carrying attachments. It should be able to rest on a folding chair, which will be next to competition table. It should be big enough to easily find pieces and can be used to hold mission models.
- KEY POINT: Remember to label all containers with the team name and the coach's cell phone number.
 - At 2009 VA/DC FLL Championship, the Sea Monster robot was accidentally taken away during the post-tournament cleanup.

STORAGE CONTAINERS (continued)



CONFIGURING ROBOT FOR COMPETITION

- **KEY POINT:** It is imperative that auto-shutoff be turned off. During early rounds, it can sometimes take up to 15 minutes from arriving at the table until the round starts. An auto-shutoff could turn off the robot and your team won't even know it until they attempt to start the robot. This can completely throw the round. Procedure:
 1. Select Settings
 2. Select Sleep
 3. Select Never
- Turn off Bluetooth. The danger is that the robot can be accidentally reflashed by a competitor. Procedure:
 1. Select Bluetooth
 2. Select Off

WHAT TO BRING

- Primary and backup robot, each in its labeled storage bin with charger and reflash cable
- All of the attachments in labeled storage bin
 - At 2007 Power Puzzle regional, I forgot to bring a strategic object. When discovered, I raced home as the practice round took place. The Sea Monsters fared very badly, scoring a low 75-point round. The strategic object was used to move the dam into its scoring location. Henceforth, we all remember to bring the “dam” piece.
- Mat and mission pieces (leave in car when not used)
 - Why? First, to use if missing from practice table. Second, to troubleshoot robot issues when practice table is not available. Third, prevents above accident of mistaking strategic object from mission piece and not bringing.

WHAT TO BRING (continued)

- Laptop computer and charger
- Missions backed up to thumb drive
- List of parents' cell phone numbers
- Signed consent & release forms
- Team info sheets (minimum of four, but bring extras)
- Registration fee
- Official challenge and latest Q&A update
- Scoring sheets and clipboard to write on
- Research props
- Tri-board with research description and team info

WHAT TO BRING (continued)

- Robot design documentation (two copies)
- Stopwatch for practice timing
- Snack food (assign to another parent)
- Flashlight for troubleshooting light sensors
- Tape measure (can check if robot under 16" height)
- Lego pieces (keep at car when not needed)
- Extension cord, power strip and duct tape to secure them
- Video camera for recording non-robot performance rounds
- (Optional) team hats
- (Optional for VA/DC FLL tournament) trading doodads

MASTER SCHEDULE

- Either before or at the beginning of the tournament, create a master schedule:
 - Time of rounds and when to leave for them
 - Tentative slot times for practice table
 - Lunch time
- Assign one parent to sign up practice table times.
- Assign one parent to arrange lunch unless sold at tournament. Remind parent that coaches need to be fed, too. (Learned this one the hard way.)
- Remind parents that under no conditions can they take their child from the tournament, including lunch. Tournament schedules are tight and somewhat unpredictable.

HOW COACH SHOULD BEHAVE AT TOURNAMENTS

- The tournament can be really stressful for the young competitors. It is easy to make mistakes and kids can beat themselves up over them. They can break down in tears or get so frustrated that they won't be receptive to suggestions.
- So the most important thing is to be a sea of calm. Recognize first that all the preparation work is done and it is really up to the kids at this point. Your job is to ensure that they get to their rounds, that they stay focused during the rounds, and most importantly, that they have fun.
- What not to do: be overly critical of your kids. It isn't gracious and can ruin their FLL experience.

PRE-TOURNAMENT COACHES MEETING

- Don't miss!
- KEY POINT: Get an official ruling of where storage of objects outside base is allowed.
- From 2011 Food Factor challenge: *"If you feel crowded in Base, storage and handling of the robot and other objects may extend over Base lines, as long as there is absolutely nothing strategic about this temporary spillover."*
- The above really isn't all that clear. Generally, the head referee will allow objects to be stored in the northwest area of table, but the other referees may not know this. Very important to get this resolved up front.

ON DECK FOR ROUND

- Make sure that you have all of the following:
 - Entire team
 - Robot
 - Attachments and strategic objects
- Robot should have on starting attachments and be ready to go.
- Ensure that team is stripped of anything that can get in the way:
 - Jackets and loose clothing that can fall over onto table
 - Necklaces and bracelets
 - Loose hair
 - Hats that aren't tight
- Coach's role is to keep team calm.
- Ban any trash talking and other disrespectful behavior.

DURING THE ROUND

- Primary role of the coach is to keep the kids focused and not miss their turn on the table. If they are sufficiently well drilled, usually little will be required.
- Second, coach should update score sheet to hand to team representative for final tally.
- **KEY POINT:** If the round is going well, remind the team not to celebrate until after the buzzer sounds.
 - At 2007 Power Puzzle regional, Sea Monsters had completed a perfect 400 round ten seconds before the buzzer. Team jumped up and down including the coaches, causing the solar panel scoring piece to bounce off the house roof and costing 15 points.

ON MY SOAPBOX: SCORING THE ROUND

- SOAPBOX: I'm a huge fan of FLL, but I very much dislike the dynamics of how scoring is done at the table.
 - Only one team member (an 11- or 12-year-old for Division I) is allowed to negotiate with an adult referee. The coach is not part of the proceedings.
 - For all his or her life the team representative has been used to being deferential to adults, but now must stand his or her ground.
 - The referee has typically been trained in the last day and may never have even seen an FLL competition before, so he or she may not fully understand rule nuances.
 - The referee is under pressure to complete the scoring in two minutes and can easily make a mistake.
 - The team rep is pushed to review the score sheet quickly and sign.
 - Once signed, it cannot be appealed. Even a small mistake can be costly.

SCORING THE ROUND (continued)

- So given the dynamics and the stakes, what should be done?
- Before the round:
 - Pick the team representative who best understands the challenge, can stand his or her ground, and can observe most of the round.
 - At the table practice drills prior to the tournament, score the rounds with the official score sheet. This will give the team representative experience with the score sheet.
 - Some of the time, deliberately say one thing but score differently. This happens in the round, so it is imperative that the team representative not be caught.

SCORING THE ROUND (continued)

- At end of round:
 - Fill score sheet copy and hand to team representative. Advise team representative to compare with referee's score sheet.
 - Train team representative that if the referee misinterprets the challenge, refuse to sign but instead appeal to head referee.
 - Train team representative that if mission is border-line completed, ask for the benefit of doubt. Nothing to lose and again be willing to appeal to head referee.
 - Lastly, stand nearby team representative and referee during scoring to observe and advise team representative.

END OF ROUND

- Train team to retrieve robot, attachments and strategic objects and place in storage boxes.
- Make sure not to accidentally take a mission object.
 - This can throw off the next table competition and head referee will have to chase down team to retrieve object. This happened once to the Sea Monsters and it was enormously embarrassing.

AFTER ROUND DEBRIEF

- After the round is over, gather the team in a quiet area. (Fine for team's families to be included.)
- Discuss what went well and what could be improved. Be sure that feedback must be constructive and not critical of each other.
- Add up the score.
- Discuss what should be done to prepare for next round. For instance, if the team struggled on a transition, work on the transition at the practice table or elsewhere before the next round.

BETWEEN ROUNDS

- KEY POINT: Plug the battery charger into the robot between rounds. It is imperative that the robot's battery be topped off for best performance.
- Work with a couple of team members to tune robot performance, as needed.
- Ensure that every team member's location is known by a coach so that they can be gathered quickly before next round.
- Encourage kids to have fun, talk with other teams and look at their team posters.
- Configure robot for first mission.

ATTENDING NON-ROBOT PERFORMANCE ROUNDS

- VA / DC FLL allows two adults and a historian in the room to watch.
- KEY POINT: Coaches and parents shouldn't attend non-robot performance rounds.
 - It is distracting to your team.
 - They will be looking to you for cues on what to do.
 - It shows real confidence in your team not to be there.
- Instead, set up a video camera and leave room. Alternatively, ask someone not known to your team to videotape the round.

PREPARING FOR TEAMWORK

- Two truly great resources for teamwork are Odyssey of the Mind (www.odysseyofthemind.com) and Destination ImagiNation (www.idodi.org). One third of their competition scores are based on spontaneous teamwork problems.
- If either is done at your school, enlist help from the coach in training your team.
- Make use of the above websites to get spontaneous practice problems.

PREPARING FOR TEAMWORK (continued)

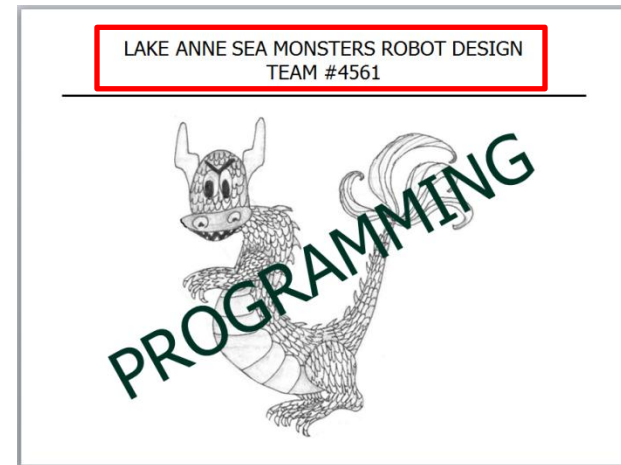
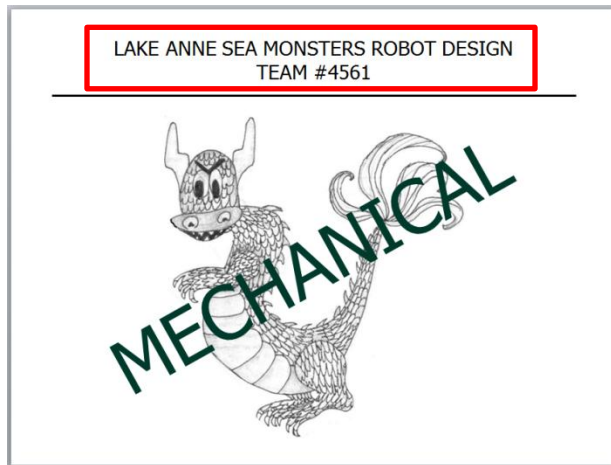
- My son's Odyssey of the Mind team finished fifth at the 2008 world finals (very proud parent).
- What I learned from him and his very talented coaches, Aurian Lotter and Stacey Freer:
 - Designate a leader, who solicits ideas from the team and directs them in solving the problem.
 - Designate a timekeeper to keep them on time.
 - Have team practice raising hands to volunteer ideas.
- Spend 10 minutes at each weekly practice to do a drill and provide quick feedback.
- Team Tiki of McLean, VA, who took first place in teamwork at 2006 FLL World Festival, practiced blindfolding team members and having another direct them around an obstacle course.

PREPARING FOR ROBOT DESIGN

- Two basic elements:
 - Documentation
 - Demonstrating to judges
- Robot design evaluation may have two judges, one focusing on mechanical design and the other on programming. Therefore, prepare for each separately.
- What to bring:
 - Team info sheet
 - Two copies of robot documentation
 - Robot & attachments as if going to robot performance round
 - Backup robot for demonstrating mechanical design

ROBOT DESIGN DOCUMENTATION

- KEY POINT: Prepare separate robot design documents for mechanical and programming. Below are the files *Sea Monster Robot Design Food Factor - Mechanical.pptx* and *Sea Monster Robot Design Food Factor - Programming.pptx*.



- KEY POINT: Put the team name and team number on the covers of the robot design documents.
- Put documents in clear cover binders.
- Put tabs on the page bottoms for finding topics quickly.

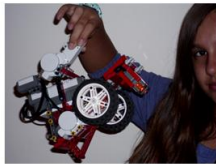
ROBOT DESIGN DOCUMENTATION (continued)

- Request that robot design and research documentation be returned at the tournament.
- Why? You may get lucky that the judge returns it personally. This happened to the Sea Monsters at the 2011 Food Factor regional tournament. The judge was Maryland's head robot design judge. Lessons learned from his feedback are reflected in this section. They were instrumental in the Sea Monster's first place robot design finish at the 2011 VA / DC FLL Championship.

MECHANICAL DESIGN DOCUMENTATION

- Keep it simple for the kids to prepare by taking pictures and adding captions to highlight key points.
- For 2011 Food Factor competition, we particularly emphasized (1) overall robot sturdiness and (2) cleverness of a particular attachment.

OUR ROBOT

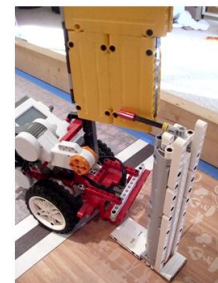


- VERY STURDY DESIGN
 - ARM MOTOR AND FRONT ATTACHMENT POINTS WON'T COME OFF!



3

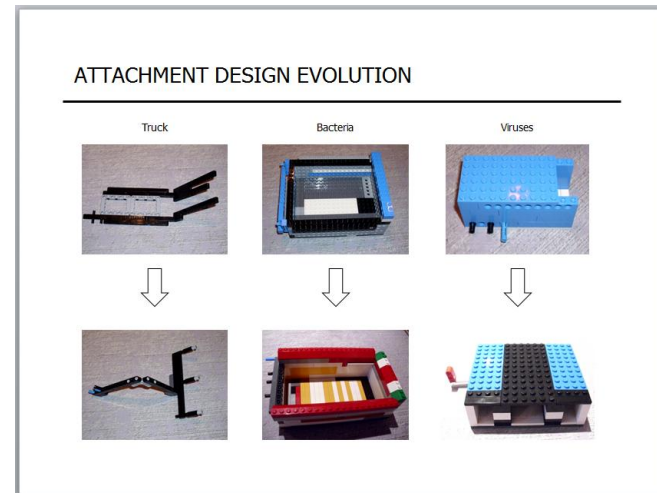
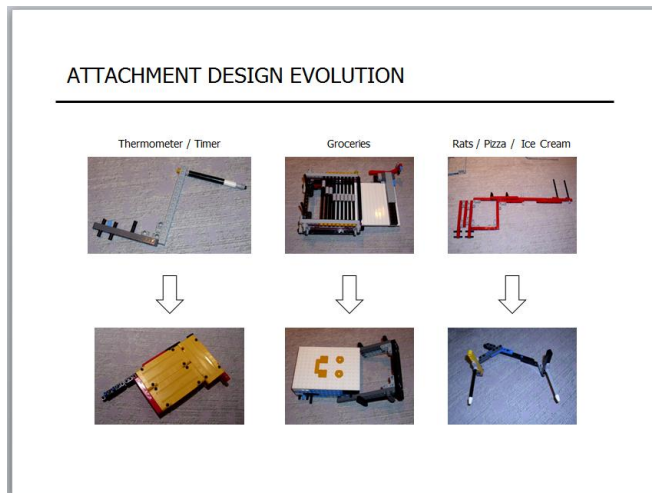
BEST ATTACHMENT: THERMOMETER / TIMER



7

MECHANICAL DESIGN DOCUMENTATION (continued)

- Document analyses that were performed, such as picking light sensor mounting locations.
- **KEY POINT:** Save or take pictures of earlier attachment designs to show the design evolution.
 - Judges can't help but ask why the team made the changes that they did. Rehearse with team their answers.

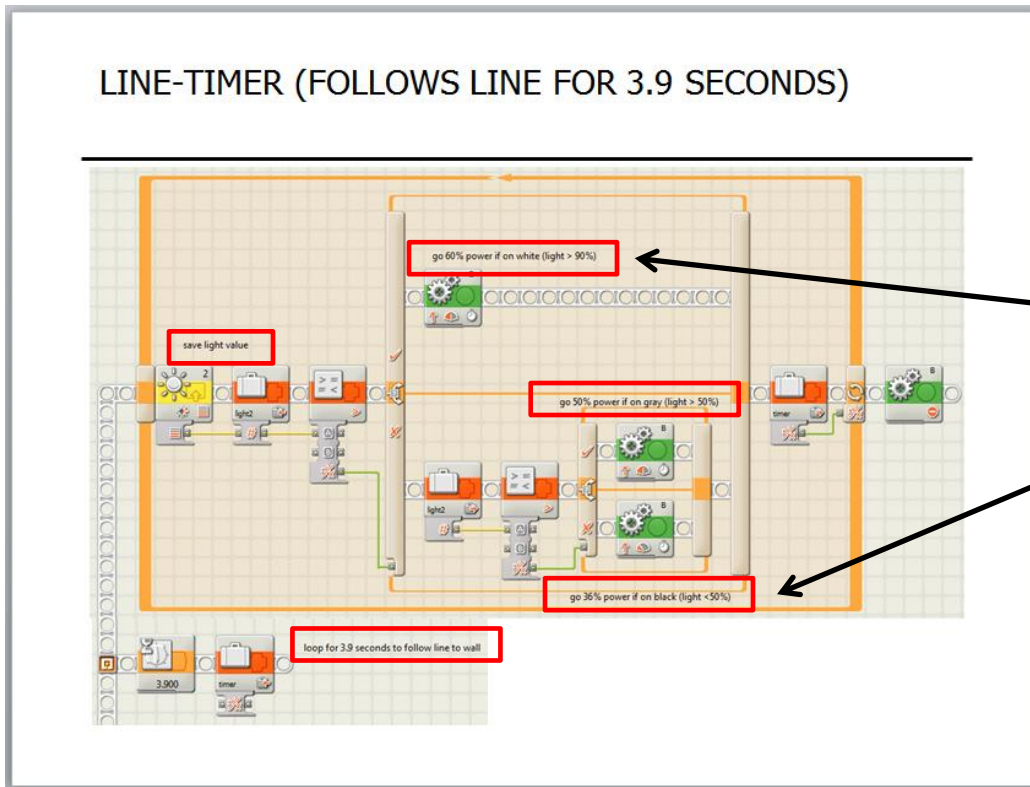


MECHANICAL DESIGN PRESENTATION

- Practice having team answer questions that may be asked by the judge:
 - Who designed the robot?
 - Who designed this attachment and why was it designed this way?
 - What has worked particularly well?
 - What was most difficult?
- You'll want the team to share credit and describe how they collaborated. (This is often not their natural instinct where individuals will want most of the credit.)
- Have them describe basic design rules they used, like a 3' drop test of their attachments to verify robustness.

PROGRAMMING DESIGN DOCUMENTATION

- You don't need to include every program. Instead, capture the main program, and the most interesting mission(s) and key blocks.



Add comments to program within Mindstorms NXT. Ideally, there should be enough comments for the judge to determine the gist of the program.

PROGRAMMING DESIGN DOCUMENTATION (continued)

- To capture the Mindstorms NXT program, use Snipping Tool built into Windows 7 or my personal favorite, Snagit. Then paste into PowerPoint.
- Designate team members to talk through different missions and highlight particularly clever elements.

PROGRAMMING DESIGN DOCUMENTATION (continued)

- Include a page showing what the overall program takes in time and maximum potential score. Have team members explain tradeoffs they've taken to minimize time and maximize score. Have them explain their time budget for transitions.

TIMING & SCORING OF BLOCKS

Block	Objects	Time (secs)	Score
Queso	Blue rat	11.0	15
Pizza Man 2	Red rat, pizza, ice cream	23.5	29
Go Fish Go	Fish, blue ball	5.3	13
Bacbucket	Collects green bacteria	4.9	12
Bacbucket#2	Collects pink bacteria	6.1	12
Sweet Corn	Corn and yellow ball	4.1	9
Truck	Truck	6.2	9
Happy Meal	Groceries	8.6	24
Fish Go Home	Returns small fish	3.3	0
Sink*	Deposits viruses	8.7	13
No Time	Thermometer, timer, touch east wall	26.3	43
	<no touch bonus - yellow bacteria>		72
		108.0	251

*excluded from Little Mac program

ANOTHER ROBOT DESIGN DOCUMENTATION

- Another example of robot design documentation can be found in *Vector 67 Design Presentation.pdf*. Vector 67 finished second in robot performance at the 2010 World Festival after achieving a string of perfect scores on the table.

"We Don't Need Roads!"

1. Chassis/robot design dictated by getting into the dynamometer area (considered 4WD)
2. Wide axle, short wheel base, center of mass moved toward drive wheels
3. Hinged back bumper and front shock absorber to hop barrier (see video)
4. Eight alignments (one angled) to increase reliability



40 Sec

3M
Backwell Automation
FLL
FIRST LEGO League

● Sensor Reading
● Robot Alignment

ROBOT DESIGN – AT THE TABLE

- KEY POINT: There is likely not enough time to run through all of the programmed missions in robot design. So pick three to demonstrate.
- KEY POINT: Assign a team member to give a play-by-play description of what the robot is doing and why. Practice this a few times because this won't be natural to do for the team member.
- Practice having each team member give a very short description of what they worked on.
- In fact, have them practice entering the room, handing over the team info sheet and documentation, introducing themselves with the above short descriptions, and then going straight to running the three missions.

PRACTICE & 1st ROUND SCORES

- Okay, so the practice round went really badly and so did the first round. Despite working hard and drilling the team, many missions failed.
- This is to be expected. Going from the team's practice table to the pressure cooker of the tournament takes some adjustment.
- As a coach, be the sea of calm. Focus on the fun and simple things to do better.
- In 2007 Power Puzzle regional, Sea Monsters had a 75* in the practice round, but finished with 400** in final round.

*See What to Bring (page 22)

**See During the Round (page 29)

PRACTICE TABLE

- As noted before, have a parent sign up the practice table. If the tournament has an open signup sheet, don't be piggy. It is not gracious professionalism!
- At the first practice session, do a couple of dry runs.
- At subsequent practice sessions, concentrate on missions that need to run smoother.
- Start and finish table on time and restore table setup.
- **KEY POINT:** Practice tables will be the worst constructed tables at the tournament and the mission models may be made imperfectly or missing. Take this into account when evaluating the robot's performance.

BETWEEN REGIONALS AND VA/DC FLL CHAMPIONSHIP

- First of all, congratulations!
- Next, take a hard assessment of what can be improved. If possible, do this with the team. Did you see any really good solutions from your competitors that you should adopt?
- For 2009 Smart Move, the Sea Monsters were an alternate for VA/DC FLL Championship. The day before Thanksgiving, we were informed that we qualified. We had an all-day session during Thanksgiving weekend, raising our score by 120 points. At VA/DC FLL the next weekend, we finished 2nd in robot performance.
- **KEY POINT:** Don't coast going into VA/DC FLL; your competition won't.

KEY POINT SUMMARY

- Attach second 2 x 4 along north wall. Attach a short “shelf” to middle of second 2 x 4 (page 3).
- At every team practice, ask what does “gracious professionalism” mean and ask for examples (page 8).
- Buy a second Mindstorms NXT kit (page 12).
- No later than week 4, the basic robot design needs to be decided (page 13).
- If your regional tournament is not the first of the year, visit another tournament (page 18).
- Volunteer to judge at other tournaments to get smarter on non-robot performance competitions (page 19).
- Buy a dedicated storage container for carrying the robot to competition (page 20).

KEY POINT SUMMARY (continued)

- Remember to label all containers with the team name and the coach's cell phone number (page 20).
- It is imperative that auto-shutoff be turned off (page 22).
- Get an official ruling of where storage of objects outside base is allowed (page 28).
- If the round is going well, remind the team not to celebrate until after the buzzer sounds (page 30).
- Plug the battery charger into the robot between rounds (page 36).
- Coaches and parents shouldn't attend non-robot performance rounds (page 37).
- Prepare separate robot design documents for mechanical and programming (page 41).

KEY POINT SUMMARY (continued)

- Put the team name and team number on the covers of the robot design documents (page 41).
- Save or take pictures of earlier attachment designs to show the design evolution (page 44).
- There is likely not enough time to run through all of the programmed missions in robot design. So pick three to demonstrate. (Page 50)
- Assign a team member to give a play-by-play description of what the robot is doing and why. Practice this a few times because this won't be natural to do for the team member. (Page 50)

KEY POINT SUMMARY (continued)

- Practice tables will be the worst constructed tables at the tournament and the mission models may be made imperfectly or missing. Take this into account when evaluating the robot's performance. (Page 52)
- Don't coast going into VA/DC FLL; your competition won't (page 53).