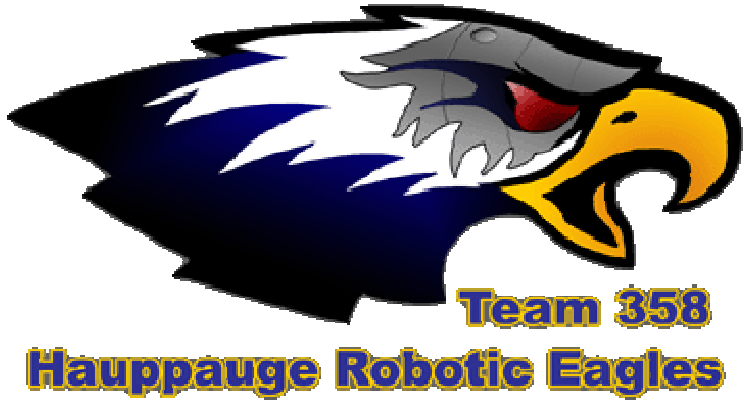
For Inspiration and Recognition of Science and Technology



Team358.org

Mentor Handbook

Updated Summer-2006

Forward

Here's a view of our FIRST team from the perspective of the new volunteer adult mentor, to help us develop a common team approach to mentoring. Since senior students also serve as mentors this can help with the student-mentor transition as well.
This handbook is intended to be a reference rather than a novelization. You don't have to read this cover-to-cover. Go right to whatever you what to know more about – costs, schedule, etc. Want to know what a competition is like? It isn't even in here! That's in the Appendix.
Probably the sections of most interest are: Mentoring Guidelines and A Mentor Is... We have handbooks for each major type of team member: student, parent, mentor, officer, and advisor. These share some common material: Our mission/objectives, team management/background/organization/schedule, etc.

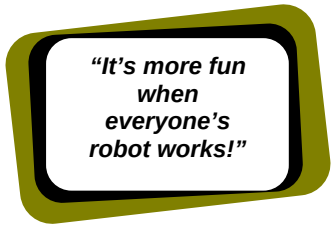
The emphasis is on inspiring students by example to become engineers and technologists. Working side-by-side with experienced mentors and professionals, including everyone in the work. We are trying to achieve a 50/50 mix of student/mentor participation. Think of the Team as an engineering firm where the mentors share work and supervisory duties with the experience, veteran students on our team. The team together, students and mentors alike, are involved in strategy and design decisions. We can explore experimental design concepts, but need to agree on a final design that will work for the game at hand.

- Advisor Handbook – Behind the scenes administration required to operate the team.
- Handbook Appendices – Travel, what to expect at competitions, detailed rules of conduct, fundraising history.

References

- FIRST Mentor Guide www.usfirst.org/robotics/mentorgde06.pdf
- Chiefdelphi team technical forums: www.chiefdelphi.com/forums
- National Mentoring center: www.nwrel.org/mentoring/
- The Mentoring Leadership & Resource Network: www.mentors.net
- Introduction to FIRST Technology
- Team Business Plan / 5-Year Strategic Plan
- FIRST Team Safety Manual: www.usfirst.org/robotics/2006/2006teamsafetymanual.pdf
- A Mentor Is…

Find Out More



- team358.org – Our website
- www.usfirst.org – FIRST website
- www.chiefdelphi.com/forums – Team discussion forum
- www.firstnemo.org – NEMO (Non-Engineering Mentor Organization) is a support group and information exchange for those adult non-engineering mentors.

Team Contacts (2006-2007)

Email and phone contact information is maintained separately and is available on the team contact list.

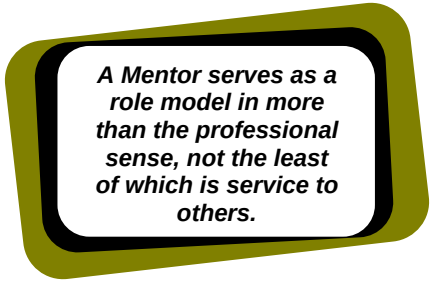
- Student Officers
  - President - Chris Citro
  - Vice Presidents - Greg Bixson & Shawn Mooney
  - Scout Master - Collin Clifford
  - Head of Engineering - Scott Thornton
  - Secretary - Meredith McLeod
- Advisors
  - Mr. Mark McLeod
  - Mr. Ken Tiu
- Sponsor Representative
  - Mr. Scott Schuler
- Booster Club
  - President – Mrs. Sheryl Moore
  - Treasurer – Mrs. Rose Morales

Handbooks in This Series

These handbooks must be living, dynamic documents if we are to continue to succeed. Coming up with fresh ideas, trying new approaches, and revisiting lapsed practices all serve to keep our creative energies flowing and everyone fully involved. These handbooks are not the culmination of what we know and how we operate, but always the beginning. The message in this series of team handbooks needs to be told verbally and visually as well as in print. These handbooks will be updated and revised yearly, usually during the summer downtime, to include new best-practices, schedule evolution, significant successes/failures, and fresh ideas.

- Student Handbook – Student roles on the team and in the FIRST program
- Officer Handbook – Student officer duties and concerns
- Parent Handbook – How parents contribute to the Team and FIRST program
- Mentor Handbook – Involvement of volunteer mentors

If there is a single point to take away from this Handbook it is FIRST's concept of Gracious Professionalism (GP). GP stands for sportsmanship above and beyond the normal. GP means being as supportive to the students on other teams as we are to our own. We want ALL students to be inspired by what we can do. GP does not demand that our kindness be returned before we decide to give ours, it is not a stick with which to bludgeon our competitors if we don't think they practice GP. The importance of GP is to better ourselves, rather than others, becoming responsible citizens and improving our society by example. Years from now our team alumni will remember a great play, some adversity overcome, helping out another team in need, but not so much the plastic trophies collecting dust in a school display case. We hope that alumni from other teams remember our kids as well for helping them get a robot running, as good sports, fun to be with.



- Team meeting one evening a week until the end of school organizing the robotics room, laying plans, and working on projects.
- Officer elections
- Year-end debrief reports from officers-what worked, what didn't, and recommendations.
- June end-of-year party and awards
  - Team awards (seniors, mentors, boosters, sponsors, members-at-large)
  - Season assessment
    - Synopsis of the year
    - What could have made this year more enjoyable and rewarding?
    - Was everyone engaged and will they return?
    - Did the veterans all teach something to at least one other person?
    - Did everyone learn something from a mentor?
    - Reflections

SUMMER – light effort

- Casual experimentation and special projects and Fall prep.
- Self-taught Computer Aided Design and Animation

A Mentor gives the student room to explore and "find" themselves and their special interests.

Team Communication

team358.org – Our website is our *primary* source for schedules, news, history, photographs and videos, technical papers, organization, fundraising, as well as topical discussions. The student Secretary also commands all modern forms of communication (IM, email, phone, USPS). Provide an email address and you can expect periodic email from the Secretaries and advisors. Information may also come by flyer, mail, the regular morning high school PA announcements, or discussion at Team meetings.

General Schedule

The detailed team schedule is to be found on our team website (team358.org) and is updated frequently.

FALL – moderate schedule

- Team meeting one evening a week training new members by working on a common project
- Fundraising events, such as our Oldies Concert
- Outreach/demo. events, e.g., Safe Halloween and Homecoming
- Off-season competitions

WINTER – Busiest time for us

- January Saturday kickoff – game and rules are revealed via webcast, and we receive the motors & electronics we must use along with any specialized equipment required by the game.
- Jan/Feb: Intense 6 weeks of robot design and construction, generally 6pm – 10pm, but schoolwork comes first so students don't have to attend the full time or every meeting.
  - Rookie mentoring visits
  - Brainstorming game play, strategies, robot designs
  - Construction of practice field
  - Design/build/integrate sub-systems
  - Test and redesign/rebuild where necessary
  - Final programming integration
  - Driver testing
  - Robot ships and we rest

SPRING – heavy involvement only during events

- Fix-it Windows – one or two evenings a week to make replacement parts
- Two March three-day Regional events. A local competition at Hofstra and one away trip.
- Late April Championships are held in Atlanta, GA
- Outreach activities such as I-CON at Stony Brook

Mission Statement

Directly *involve* students in the professional field of engineering through collaboration with volunteer professional engineers and in partnership with Festo Corporation. All work together as a team to invent technology and design and build a robot to meet the FIRST robotic competition challenge. The FIRST program builds self-confidence, knowledge, and life skills while motivating young people to pursue opportunities in science, technology, and engineering.

Team Objectives

FIRST is the brainchild of inventor Dean Kamen, who created, among other inventions, the portable dialysis machine and the Segway out of his concern for applying our talents for social good. It is an organization with the goal of generating interest among young people in science and engineering. Not only does FIRST support science, but it also hopes to create better people, therefore social conscious engineers, by teaching its creed of gracious professionalism. Although the FIRST Robotics Competition is about creating an innovative robot, it also calls for helping one another as much as possible. All of the FIRST Robotics teams are there for each other, whether they're helping each other with parts and materials, creating custom machined parts for each other, or simply offering advice and suggestions.

- Build character and citizenship through community service, sportsmanship, helping others: through Gracious Professionalism (GP) – We come together to compete, and compete hard, but we want every team to have an equal opportunity and experience. Our team motto is "It's More Fun When Everyone's Robot Works!" There is no "they," only "us" - friendly, helpful, courteous, kind - don't win at another's expense. GP is a goal for individuals and teams to achieve, not a complaint to level against others. Those who find themselves accusing others of non-GP conduct are those who have failed to exhibit GP. The FIRST robotics competition is structured like a sporting event, however, we strive to emphasize sportsmanship rather than the sport. We want all the robots to compete at their best, so all students are equally inspired. For example, if an opponent breaks a chain, we help them fix it, so we can all be the best we can be. If our opposing alliance has no time-outs remaining, but a critical repair to make, then we take the timeout for them.

The robot is of secondary concern, the students are primary.

- Be competitive, but it is much, much more than a game.
- Expose high school students to college- and professional-level applied technology.
- Develop skills in technology, leadership, teamwork.
- Dedicate ourselves to continuous improvement. Ours is not a static organization. We look for new challenges and constantly experiment with improvements and new methods of operating our team and engineering.
- Expect 100% from all participants – students, mentors, parents as a united organization, not an individual's science fair project. Satisfy the needs of all participants: students for learning, mentors for personal growth, technical challenge for all.

Team Background

Team 358 was started in 1999 for the 2000 competition season in a collaboration between Hans Zobel of our principal sponsor, Festo Corp., and the Hauppauge School District Superintendent. Hans was also involved with helping SBPLI get the FIRST Long Island Regional and several other teams started that same year. Mr. Tiu, a teacher at Hauppauge, and Mr. Schuler of Festo have been on the Team since that beginning. We have earned numerous technical, Regional Champion, and Finalist awards, along with FIRST's highest, the Regional Chairman's Award. Additionally, we have mentored many new teams and assisted numerous other teams with technical workshops, tools, parts, and expertise. A detailed, year-by-year history is available on our team website.

Team Organization

- Student Officers – outreach, publicity, recruitment, design/build/competition
- Advisors – school legalities/rules, supervision, mentors, advice
- Technical mentors - mechanical, electrical, pneumatics, programming, etc.
- Booster Club – fundraising, food, travel arrangements, chaperoning.
- Sponsors – financial, engineering, and material support.

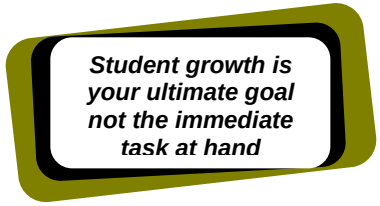
Student Commitment:

Reality sets in when we realize there is no perfect progression for students maturing through our program. Students will make false starts, lose motivation, some will always want to be told what to do, others will be distracted by a driver's license, start serious dating, or we'll lose experienced students to Senioritis. As mentors we help and encourage them through these rough spots.

- Students will not always be able to attend robotics regularly. They have overriding commitments like regular school classes, SAT, AP, regular tests and exams, homework, school events, extracurricular activities such as music, sports, religion, family obligations.
- Many will be resistant to doing anything for fear of doing something wrong. Others will jump right in even if they make mistakes right and left.
- Hitting a roadblock, even a minor one, will cause some to just walk away and leave a project undone.
- Their stated goals will sometimes be at odds with what they are doing or how they are approaching things. We'll need to bring the discrepancy to their attention and force them to make a conscious decision to either change their goals or change what they are doing.

- Strive for quality outreach primarily through mentoring, technical support, and sweat - many teams lack mentors altogether or may lack in one specialty such as computer science or mechanical engineering.
- Contribute to quality growth and increased technical capabilities of teams on Long Island.
- Maintain a positive, supportive attitude for our team and others at all times.
- Attract a diverse team population so we can expand each others minds.
- Have fun.

We are concerned foremost with our Team's health and sustainability, but we also introduce the students to broader concerns of the FIRST community that affect us. Engineering ethics teaches that what we do has far reaching effects and we are concerned that those effects are positive. Invent with concern for others.



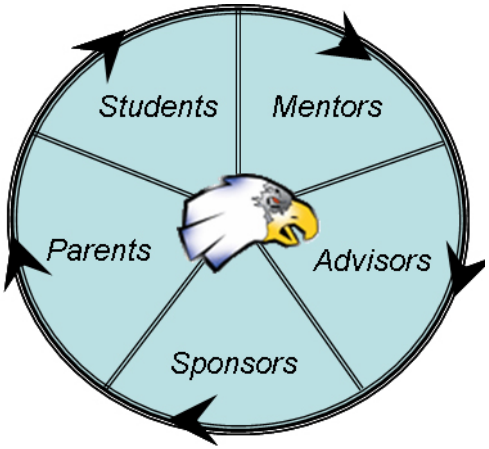
We support a growing vibrant FIRST community. We support our Regional Director and Committee, and the School-Business Partnership of Long Island (SBPLI) to insure the growth of the FIRST program on Long Island, and we work cooperatively with other teams to support them and receive support in return. Our motto for many years has been "It's more fun when everyone's robot works." We don't lose sight of our goal to get more students interested in science and technology, whether those students attend Hauppauge or some other school. We have several team members (both students and mentors) from nearby districts that do not have teams or that are considering starting teams. We also mentor both rookie and veteran teams to smooth their entry into FIRST and help the number of teams on Long Island to grow.

Team Management

Our Team brings a unique experience to students, a six week career in engineering. A different way of involving students by not just playing with robots in an after school club but working in a true engineering environment with and alongside of professional engineers. This is not your typical teacher/student relationship but is run as a small business firm, with freshmen students as the new interns, seniors as the group leaders/supervisors, and mentors as the old salts/managers.

FIRST allows for a wide-range of approaches to running a team, from after-school club style with no parent or mentor involvement to teams that build at a sponsor's facility with full engineering and machining support. From FIRST's perspective, all approaches are valid as long as they achieve the primary goal of inspiring youth. Team 358 has settled on a teamwork approach that involves ALL team participants equally – students, mentors, parents, advisors, and sponsors all give all they can and everyone has ownership. Students develop an appreciation for engineering by working hands-on side-by-side with professional engineers. All hands are on the robot together, and all ideas are heard and debated as a team.

Because we are a co-curricular school organization, ultimate authority for the team lies with the advisors and school district administration; however, the team is an assembly of volunteers - students, mentors, parents - and the team will thrive if all are empowered to insure our success and achieve our goals.



Outreach, robot designs, construction practices, the

Your Commitment:

- *Time* - As a mentor you already have career, family and other demands on your time. The time you donate to our team is valuable to us, and the team meets in the evenings so you can be there. The most intense period where you are needed is during the 6-weeks from January to February.

- *Effort* - Your experience tells you how to solve problems, and that will lead to research outside normal meetings necessary to find solutions or parts. There will be technology new to you and applications specific to robotics that you will need to learn along with the students. It can be invigorating to say the least!

- *Dependability* - You won't be able to make every meeting, just as the students will not be able to do so. If you find yourself mentoring a particular group of students or guiding a certain task, try to arrange some sort of regular schedule when the majority of you can meet and work together.

A Mentor avoids sarcasm, condescension, and other verbal and non-verbal slights.

you'll also be training/advising local team parents or other new mentors to take over. We mentor the mentors just to get them up-to-speed. We enlist and nurture new mentors for other teams. Maybe you know someone at work, a relative, a friend, a retiree - get them excited and involved. Particular attention should be paid to enlisting the new team parents and their acquaintances in any kind of support role, mentor or booster.

Expectations

Mentoring takes us beyond mere robotics. We provide a supportive environment and help students develop career goals, personal goals, and maturity. They will soak up not just technical skills, but decision making, organization, teamwork, social skills as well. Most of their learning will come from your example, how you approach a problem, how you test concepts, how you resolve problems or issues, how you deal with others. At different times, the mentor may be a role model, teacher, advocate, sponsor, advisor, guide, developer of skills, refiner of intellect, listener, coach, challenger, visionary, balancer, friend, sharer, facilitator, and resource provider. Along with these roles comes a responsibility to consider the psychological dimensions of the relationship, for example, accepting, confirming, counseling, and protecting.

Our time on the Team as mentors is limited, so provide a legacy. See that our designs, innovations, even mundane everyday tasks such as proper soldering techniques are recorded for posterity as a technical paper by the students and/or mentors complete with wiring schematics, design limitations, materials down to the part number and sources. Everything that a freshmen or rookie team working alone would need to do the job without much fore-knowledge. Teach the students how to establish records.

competitions we choose to attend are all up for popular debate and discussion in our practice of shared leadership. During the brainstorming sessions after Kickoff, for example, students and mentors will split into sub-groups to develop, then defend before the team, alternative design approaches. Overriding concerns such as risk, cost, detailed design time, machining capabilities, labor, etc. will be given weight in coming to a final group decision. In the event of ties, conflicts, sudden changes in circumstances, etc., decisions will be reached by the advisors and student officers, with the lead advisor making final rulings as required and bearing the responsibility.

Mentoring Guidelines

FIRST has published a Mentoring Guide that is a pretty good introduction and discussion of the fundamentals of mentoring, coaching, facilitating. Please read that for How-To ideas. Try to keep it interesting and mix-up the approach and style you use.

Approaches can also change based on the student's personality, attitude, aptitude, skill, and knowledge. What works with one student might turn-off another. A diversity of styles and approaches is most likely to reach the diversity of students we see. Most new mentors have never done anything like robotics before. It's a pretty specialized application and while the robots look complex, break it down and it will become familiar ground for you. You'll be a student yourself as you come up to speed, but you'll be amazed at what the students will learn if you share your own approach to your own robotics education and take some students along with you.

As mentors we're encouraging students to pursue careers of all kinds, and while the focus is on science and technology, other career options are important as well, so talk to the students about

your job, career, educational path. Why you like what you do, what is the fun part of your job? You'll find students turning to you for advice on career, college, internship, summer jobs.

Recruit new mentors even from outside our immediate area. Other teams near the new mentors work or home can use help too, and you can facilitate getting them together. Network through friends, family, co-workers looking for mentors who aren't just engineers either. Teams need mentors with backgrounds in:

- Engineering – ME, CS, EE, systems, structural, etc.
- Manufacturing – machinist, technicians, fabricators, electricians, welders
- Other technical – 3D animation, CAD, website, information systems
- Non-technical – English, business, management, marketing, public relations, graphic design, quality control, fundraising

Mentoring Our FIRST Team

Our own team uses a hands-on mentoring approach. Striving for a unique true collaborative effort involving both mentors and students in this real-life engineering experience. Don't expect to sit idle while the kids work. They will learn by watching how you accomplish tasks and working alongside you. We feel the best way to be inspired is through a mentor/trainee relationship with everyone getting their hands dirty. Neither students nor mentors can sit idle when there is so much work to be done in such a short period of time. When a student is capable and has the knowledge then he or she takes the lead, but we won't set a student up to fail his or her teammates. If a task requires professional experience or the student with the right experience would be split too many ways,

A Mentor treats students with respect, as equals, listens quietly to their ideas, helps experiment.

Mentoring Our FIRST Community

An important goal of our team is to expand the FIRST program to inspire more students across Long Island. Some ways to build our island-wide community are: jump-starting new teams, hosting workshops, participating in other teams workshops, partnering with universities such as Hofstra and Stony Brook, making ourselves available to consult on any issue or problem. Our community mentoring extends to other teams in need whether at a competition when a robot needs repairs, or better during the build period when a new team is stumbling through the Kit-of-Parts, or best pre-season when we can give them a leg up on team organization and FIRST technology. We have shadow teams, people preparing to start teams at other schools, and students from districts lacking a team of their own participate with us all season. Building a community requires give and take, so while we help a team missing some particular expertise, tool or part, we also request advice from other teams that have an expert we lack.

We, as mentors, set the example for community outreach just by being involved with Team 358. Only a few adult mentors have time available to actively visit other teams, but our student mentors will bring questions back to the rest of us and we will relay our assistance through them, via email or by phone. For you mentors who do visit other teams, it's perfectly valid for their approach to mentoring to be completely different than ours. Adapt to the team and the circumstances. Usually a lot of training is involved and they won't have experienced students to guide younger ones. It's especially important though to develop independence and self-sufficiency within other teams. Hopefully,

they've led to really solidify what they've learned and leave a legacy for the next generation of students.

As the students come up with interesting ideas encourage them and facilitate carrying experiments through. Show an interest and evaluate/critique the results, adding suggestions for improvement and variations. Throw out ideas to the students periodically for drive train innovations, electronics, databases, website improvements, any capability potentially useful to the team as well as the FIRST community at large. Expose students to how the business world is evolving by introducing state-of-the-art management techniques, such as Six Sigma or Capability Maturity Model Integration, and discussing older efforts, such as Total Quality.

A Mentor mixes positive praise with corrections to give encouragement and positive reinforcement.

We all have a responsibility to our team and other teams we help to ensure the students compete with a working robot they will be proud of. Inspiration in this competition comes having a robot that works. We do not set the students up for failure, nor do we stand back and let an individual fail. We work with the student to accomplish the critical tasks. Show them what they don't know, teach them what they are capable of learning, handing them a task they can complete on their own. Failure, in addition to being uninspiring, isn't fair to the rest of the hard working team if it affects our performance. It is fair to the whole team that every task get completed. We do not let one task fail at the expense of all the others who have completed their tasks.

then a mentor may have to take the lead on that job. Keep an eye on directly inspiring the students by frequently consulting with them, keeping them abreast of what is being done, why it's being done that way, and discussing alternate approaches.
Think of the student progression as: apprentice to journeyman to craftsman. These translate into four phases of student maturity:

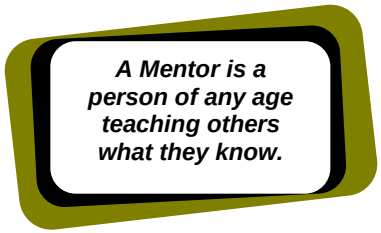
1. Mentors showing students
2. Mentors and students working together
3. Students working independently
4. Students mentoring other students (back to step 1)

Our goal is to inspire building a great robot with an even mix of students and mentors working hand-in-hand. With the goal of keeping everyone working on a task and in groups, mentors should always have something concrete to do, exposing the team to what is possible with technology, as a method of knowledge transfer, or simply as an inspiration to the students. When it comes to build season there is enough work to go around that everyone, students and mentors, will have tasks to accomplish. If the students are sitting idle and the mentors are all busy maybe the tasks are too complicated, involved, or inter-dependent. If the students are all busy, but the mentors are sitting idle then maybe we need to stretch our technology a bit. As a mentor, you might have to play with new technology yourself to get up to speed. Just take a student or two along as you experiment and explore possibilities. The prime purpose of this is for the students to see and experience directly how you, personally, approach an engineering task with analysis, experimentation, prototyping, proof of concept, whatever is called for.

Our efforts follow the seasons.

1. The **Fall** is off-season. A casual time for basic skill development, team building, experimentation and new technology development. Students will be learning the technical terminology and beginning to speak the language.
    a. Workshops for and by students and mentors
    b. Demo. boards for mechanical, electrical and pneumatic systems
    c. Skill development – technical, teamwork, organizational, process
    d. Safety and tool training
    e. Students experiment, explore, and build experience
    f. Try out and demonstrate new ideas and concepts
2. **Winter** is an intense build season focusing on meeting the schedule and producing results with little room for experimentation beyond the surprises the new game brings.
    a. Kickoff reveals the FIRST game
    b. Game deconstruction, strategy development, brainstorm solutions
    c. Prototype solutions, design sub-systems, order parts/materials, construct the robot
    d. Integrate, test, revise, troubleshoot
    e. Ship the robot
3. **Spring** is competition season. An extended slower time interrupted by brief 3-day periods of intense excitement. A lot of finish and rework gets done at our regional competitions.
    a. Two regional events. The first event is used as a shakedown of the robot.
    b. Refine strategies based on actual game play
    c. Redesign as necessary to adapt to game play
    d. Championship event
4. **Summer** is down time with low-level efforts.
    a. We'll tele-mentor independent study via email
    b. Revise the team handbooks and our 5-year plan.
    c. Plans for the Fall are made.

Emphasize teamwork and avoid students or mentors working alone. There should not be any component or operation of the robot that is understood by only one person. Several people should be trained and experienced in modifying, repairing, diagnosing every piece of the robot – mechanical, electrical, control system. We must develop our robot as a team. The sub-systems will be divied out to sub-teams (mechanical, electrical, control system), but all sub-teams must avoid parochialism and work constantly with the other sub-teams to keep them informed and agree on design changes. At integration time the systems must work together and complement That's the wrong time to discover two sub-systems don't work together or that the mechanical team changed the robot orientation and forgot to mention it to programming (that's happened a few times).



Mentors (both adults and senior students) are waiting for students to step up. The tasks must get done even if a student doesn't step up, but when a student takes initiative the mentor will first show/ discuss/ demonstrate the task and how to accomplish it (incorporating student input and ideas), will work alongside the student until satisfied that the student understands and is capable, then will step back to let the student complete the task. Inspecting the results and recommending modifications if needed. Be sensitive to what individuals are capable of, but give them stretch goals. Some students will be able to take a general task, such as design a telescoping arm, and run with it, while others must be handed a design, and others will need to be handed a part to machine or assemble. Keep challenging them at whatever level they are at. Follow up by showing students how to communicate and pass on specialized knowledge by writing a brief paper on some technology you've helped implement that expanded our team knowledge - a special circuit, mechanical device, code, sensor system. Mentor them in writing a paper of their own for the tasks