

FIRST

Mentoring **G**uide



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Introduction

This mentoring guide is provided to each team in an effort to develop an understanding of the mentor process and relationship. Students grow through the process with the mentors and absorb knowledge through guided experience.

FIRST has gathered information from various team leaders and web sites, which include America's Promise, Big Brother, Big Sister, and National Mentoring Center.

FIRST objectives for this program include

- Create a user-friendly document to make the process easier for veteran and rookie teams.
- Provide clear understanding of the mentor process and relationship.
- Develop student and mentor reciprocal learning through the Hierarchy Mentoring Process.

The mentoring guide introduces the mentor philosophy, mentor goals, mentor process, and tools the mentor can use to enhance the project.



The **M**entor **D**efined

Chapter 1

The Effective Mentor

Every adult on a FIRST team must consider themselves a mentor. Successful mentoring promotes helping students optimize the learning experience by:

- Allowing independent thought
- Opening communication
- Fostering trust and respect

Mentoring is the process by which an experienced person provides advice, support, and encouragement to a less experienced person. A mentor is a teacher or advisor who leads through guidance and example.

Mentors need to provide students with opportunities to make choices. Allowing the students to make choices and to act upon them is beneficial to everyone because it promotes co-ownership of the team.

On a FIRST team, the mentor's goal is to actively share wisdom and knowledge with the students to foster intellectual growth. Mentors need to help each other discover ways of adapting instruction to reach every student on the team. The mentors and students are equal and become united through a partnership where each works collaboratively toward a mutual and beneficial goal.

The effective mentor demonstrates the value of success he or she has encountered during his/her career path and uses these skills and successes to share knowledge and values with team members.

Mentoring Goals

Mentoring Goals

- Effective Facilitation
- Promotion of independent thought
- Development of roles within the team
- Creation of mutual foundation of trust and respect.

Effective Facilitation

Facilitation is a process through which a person helps a group complete its work and improve the way it works together. Facilitators provide direction that supports accomplishing tasks and team success. They do this by helping the team stay focused on the tasks they must complete.

Many mentors have trouble distinguishing the difference between teaching and facilitating. Teachers communicate the knowledge they have learned on a given subject to one or more people. Facilitators enable communication within a group so that everyone can contribute the knowledge they have towards the solution. In a facilitated session everyone should feel empowered to contribute. The primary job of the facilitator is to help the group free itself from internal obstacles so that it can more effectively achieve the best outcome.

Promotion of Independent Thought

To incorporate independent thought, approach problems with an open mind, treat all ideas as equal, resist any impulse to judge ideas, capture ideas as stated, and use creative problem solving strategies to move beyond conventional solutions.

Reciprocal Trust and Respect

The mentor/student relationship is based on common goals. Mutual trust and respect are natural outcomes. The foundation begins when mentors become approachable and available to students.



The Mentoring Process

Chapter 2

The Overall Role of the Mentor

- Inspire students in science and technology
- Motivate and engage students in the meaningful activities
- Create open communication
- Facilitate instruction and have students do as much work as possible

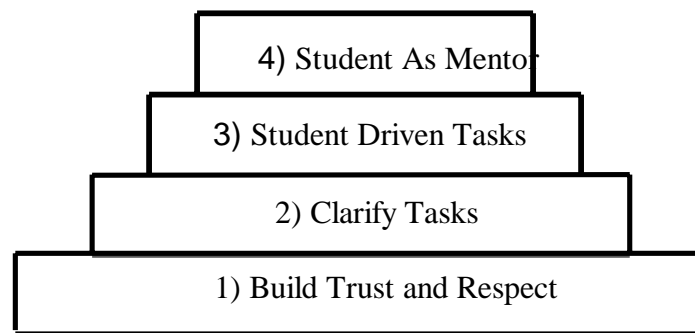
The Overall Role of the Student

- Understand Science and Technology
- Commit to the project
- Be accountable for his/her part of the team
- Understand the engineering principles and process

The Process of Mentoring

Mentoring should result in student learning. Mentoring starts when the students and adults first come together. The role of the mentor and student changes as the mentor and student work together. Ultimately, the relationship can result in the student developing skills to mentor others. **It is important to note that some team tasks which involve safety such as working in a model shop, should always require direct adult supervision regardless of the expertise and ability of the student to mentor others.**

Mentor Process Hierarchy



1) Build Trust and Respect

Develop an environment of trust and respect between mentor and student. It is important to develop this as quickly as possible with all team members. Start working on this before January if at all possible. Many teams have team building events and other activities prior to January so new team members can get to know everyone in a fun and non-chaotic environment. A key component of building trust and respect is communication. See the **Communication and Feedback** section below.

Mentor's Role

- Confidant
- Supporter
- Coach
- Show trust in and respect for every student
- Establish an environment for open and honest communication

Student's Role

- Take individual responsibility
- Develop trust and respect for adult and student team members

2) Clarify Tasks

The mentor helps the student to clarify tasks and develop strategic plans for individual tasks.

This section, *Clarify Tasks* and the following *Student Driven Tasks*, are inter-related. On most teams this is where the mentor and student will spend most of their time. Some students will quickly move through to a point where they can work independently and move on to taking on the role of mentor, while others may need direct support from an adult mentor for a longer period of time. It may take a long time for some students to get to a point where they can work independently. Do not judge students on how quickly they move from one phase to the next. Keep in mind that everyone is an individual and comes from a different background, and everyone learns at a different rate. Celebrate each student's accomplishments, both large and small. The "**Facilitate, Demonstrate, Delegate and Do**" model and "**Facilitation Pointers**" (see below) can help the mentor in helping students through these two phases.

Mentor's Role

- Coach
- Teacher
- Motivator
- Facilitator
- Maintain process focus
- Encourage students to take risks

- Encourage student accountability

Student's Role

- Being accountable for individual commitments
- Work to gain skills and knowledge
- Focus on completing directed tasks
- Assume leadership responsibilities whenever possible

3) Student Driven Tasks

The mentor becomes a sustainer rather than a teacher. The mentor's role shifts and now allows the student to initiate and complete tasks.

Mentor's Role

- Observer
- Be ready to step in when needed
- Facilitator

Student's Role

- Understand material
- Augment skills
- Prioritize work
- Complete tasks with a high level of independence

4) Student as Mentor

The student has a clear understanding of skills and is able to answer any questions relevant to skills. The mentor takes on a role of observer and allows the student to work as a mentor to other students.

Mentor's Role

- Observer
- Be ready to step in when needed

Student's Role

- Pass information on to other team members: *Mentor in Training*

Facilitation techniques for Mentors

Communication and Giving Feedback

Effective communication is key to team success. The mentor plays a major role in establishing an environment conducive to effective communication. The mentor sets the stage by being an active listener. Listen for the contribution that the student is making without judging the student. Be conscious of the student's verbal and non-verbal cues.

Be an Active Listener

- Sense: Listen before speaking
- Interpret: Evaluate what is being said
- Check: Test your understanding of what was said through paraphrasing
- Establish meaningful conversations with students and never talk down to a student
- Attempt to identify with what the student is saying and be understanding - try to put yourself in the students' shoes.
- Listen for the contribution that the student is trying to make
- Look for verbal and non-verbal cues. These signals are sometimes important in understanding what is being communicated. Some things to look for include:

Raising or lowering of voice
Rapid speech
Tone of speech
Unfocused Attention

Body positioning
Raising eyebrows
Students shifting in their seats

Resist Doing Most of the Talking Even if You Feel You Know The Correct Answer.

When communication is one way (the mentor has all of the answers), the student will not feel valued. For the mentor to break through this challenge, he/she should learn to be an active listener. Encourage open communication. Ask open-ended questions such as "what do you think" or "how do you think we should approach this?" Stay away from questions that require a simple yes or no answer. Don't jump in with your idea for the solution.

Take the Time to Make Sure Everyone Understands

The mentor may need to clarify discussions when there is a topic that some students do not understand or there is a word used that has multiple meanings. The student may not have covered the topic in school yet. The effective mentor will pay close attention to what is said and encourage the students to ask questions when something is not clear.

Giving Feedback

Mentors should observe what the student has contributed and provide positive and constructive feedback to the student to help him or her improve. The effective mentor should be objective in giving feedback to the student. Make sure the student understands that feedback is being given with the intent of helping the student improve. It is feedback on their actions or work, not a judgement on them as a person.

Give feedback immediately following the behavior if possible. Be sensitive to things that could embarrass students such as giving feedback in public. In issues of safety give the feedback immediately, even at the risk of embarrassing the students. If this happens, take them aside later on and explain that you care about what happens to them and that you were worried about their safety. Explain that you had to speak up so they would not be injured.

The mentor should be aware that not all students are receptive to receiving feedback. The student may react defensively or may act hurt. The way that the mentor delivers the message will have an impact on the reaction. Be direct, treat the student with respect, and deliver positive feedback as well as constructive feedback. For some individuals and some situations it might make sense to ask the student if he or she would like to receive feedback on his or her work. The feedback session should be two-way, allowing the students to ask questions and clarify the delivered message.

Facilitation Pointers

Facilitation

The mentor needs to develop effective facilitation skills to alleviate stress in the team:

Below are aspects of facilitation that every facilitator should understand.

Task

The task is the work the team needs to complete. It may be a simple meeting or a complex set of tasks that will take weeks to complete. The facilitator will clarify what is expected of the team without doing the tasks him or herself. The facilitator needs to be able to determine when a task is complete and to understand how the task fits in with the goals and objectives of the team.

Self

Facilitators must know themselves and how they impact the group. The facilitator's role is process, not content. The facilitator does not need to be an expert in the topic being discussed. If the facilitator is an expert, he or she must be careful that he or she is not leading the discussion to a preconceived outcome.

Group

The facilitator needs to understand the team in order to make a connection. This helps the facilitator anticipate conflict and turn the experience into a productive learning experience.

Facilitators should ask themselves questions: Have I seen this behavior before? By asking questions he/she will begin to notice the group dynamics within the team.

Caution:

Watch for the group having problems in achieving consensus. This is known as “group paralysis.” Allow time for discussion and be prepared to step in if the group cannot make decisions. Knowing when to push the decision on the group or to make the decision is a skill that must be developed over time.

Process

The process combines an understanding of the task, self and group with a set of interactive and quality tools to achieve group results.

Make sure everyone understands why you are meeting.

Identify what it is you are going to accomplish and establish criteria for agreement. It helps to write it down so everyone stays focused on what it is. This can be a simple phrase on a flip chart.

Use brainstorming techniques to get input from everyone. Write down the ideas

Weigh alternatives against objective criteria previously established. Various techniques can be used for this and the technique might depend upon the circumstances. A good facilitator will be able to get the group to narrow down the ideas. Some common techniques are weighted voting, combining similar ideas, testing the feasibility of an idea, and group consensus.

Write down any decisions, implement the selected solution, and make sure what you implement meets the original intent.

Other Tips for the Facilitator

- The facilitator needs to unite the group. If there is a problem within the team, allow the team to communicate its frustration, decide on a course of action, and then help the group move forward.
- The facilitator should not take sides in a discussion. Keep the conversation to facts, not emotion and don't let things get personal.
- The facilitator needs to focus on the group. It is the facilitator's job to keep the team focused on the topic. The facilitator should always be alert and be an active listener.
- During conversation, the facilitator should paraphrase what they hear from the others or get someone else to do so. This helps to keep the communication open
- The facilitator needs to bring quiet team members into the discussion and keep those who feel comfortable with communication from monopolizing the conversation.
- Encourage people to build on ideas that have already been presented. Make sure everyone treats all ideas with respect. Allow people to disagree with an idea or challenge an idea, but not to judge the individual.

- Document brainstormed ideas and decisions on a flipchart or whiteboard so the team can refer back to previous ideas and decisions.
- Everyone should agree up front not to reopen discussion on decisions unless all members of the team agree to do so.

Facilitate, Demonstrate, Delegate, Do Model

- Facilitate: Simplicity of design is a key component to a successful outcome and student involvement.
- Demonstrate: Challenge the students in a constructive and positive way to think ideas through. Try as hard as you can to avoid using the words “can’t be done” or “not possible.”
- Delegate: Give the students the specifications they need and help them turn the concept into reality.
- Do: Unless absolutely unavoidable, all work performed on a product should be done with assistance from students. If all members of the team share ownership in the team, the team shares the responsibility and the work.

Transfer ownership to the student in four steps.

Step 1: I Do, You Watch

Step 2: I Do, You Help

Step 3: You Do, I Help

Step 4: You Do, I Watch



Mentor **T**ools

The effective mentor will need to be aware that all students learn differently. The tools below will help the mentor effectively facilitate instruction.

Language tools

Use a variety of approaches to get students to contribute to the conversation. These phrases will help the mentors when they are facilitating in the group. These phrases work with all learning styles and encourage the student to use logical thinking skills.

Words and Phrases to stimulate responses:

- **Consider**
- **What would happen if...?**
- **How do you suppose....?**
- **Think about what might make....**
- **Visualize**
- **Compare**
- **Close your eyes and picture...**

Learning Styles

When people use their senses, they take in information. We learn when we take in information. Some people learn best by seeing something, while others learn best by hearing. Still others learn best by doing an activity. For many people it is a combination, but one style of learning probably dominates over the others. It is important for the

mentor to understand the characteristics of these different learning styles to reach every student.

Visual

- Learns by watching demonstrations
- Vivid imagination and visualizes in detail
- Needs description to help conquer goal
- Student is generally quiet by nature

Auditory

- Instruction from others is easily learned
- Visualizations are hard to interpret
- Details are less important
- Student enjoys to talk and hear others talk

Kinesthetic

- Hands-on, direct involvement
- Remembers what was done, not was said or seen
- Student may speak with gestures and stands close to the speaker during conversations

Helpful Activities

Some teams have found the following activities to be helpful in mentoring students:

Create a Contract

A contract can be an effective tool to set expectations with everyone. The mentors and students need to outline concise expectations and understanding of what is expected of each other and the team. Have each student and mentor create a contract listing these expectations of what students expect from mentors and what mentors expect from students.

Team Building Night

Team Development is very important. Host a team building night to showcase students' talents and hobbies. Have students and mentors be prepared to share information about themselves.

Team Building may consist of:

Pizza Party
Spaghetti Dinner
Ropes Course
Talent Show
Game Night (Pictionary, Scatergorries, etc.)

Evaluation by the Adult Mentors

Evaluate team progress against meeting the team's goals and objectives on a periodic basis

Each week have an adult mentor meeting and determine any next steps and resolutions to problems

Project Management and Quality Tools

Use tools to manage team activities. Give the students and exposure to the tools. The sponsoring company may be a good source for other tools.

Project Maps

Project maps are maps that are detailed timelines. A project map is helpful to lay out all responsibilities that your team will need to complete.

Brainstorm Sessions

Each working session should begin with a brainstorm session for about 15-30 min. This will begin to get your team in a creative mind set. Do not allow students to put down other student ideas. All ideas and contributions to the team are valid.

Brainstorm tools include: mind-mapping, transformative thinking, forced connections, and thinking “as if”

Cause-Effect Diagram

Teams will brainstorm and then discuss the cause and effect of each situation listed. This is a helpful tool to use before the season begins.

Problem Identification

Create a problem that can be solved using problem identification. Problem Identification consists of identifying the problem and creating more than one solution to the problem.

Logic Trees

Logic trees are useful for brainstorming purposes. The process of the diagram begins with the problem and then through the brainstorming the problem is broken down with solutions to each sub-problem.



Diversity

Embracing the differences in people gives a team the opportunity to excel. Diversity is a term that means different things to different people. When many people think of diversity, they think of gender and ethnic differences among the students. Within a student body there may be diversity in age, diversity in the track of courses that the students are following, diversity in the socioeconomic background of the students, and differences in physical and intellectual capabilities of the students. Diversity can also be looked at among the adult mentors from the perspective of gender, age, ethnic and professional background. Every team has age diversity between the mentors and the students.

Engaging a diverse group of students

The population of the school(s) in the team's FIRST partnership will naturally set some limits on the potential diversity on the team. A public school in a large city will have a very different population of students from that of a private boys' school, but diversity can be found in each school. When recruiting students, understand the population of the school and focus recruiting efforts on attracting a broad range of students at that school. For recruiting efforts, use tools that show a diverse population of students having fun. Many of the FIRST videos show FIRST as fun and present a diverse group of students talking about FIRST.

If adults from the corporation or university visit the school to recruit students, bring a diverse group of adults to do the recruiting if possible. Female students will likely be more interested if there is a female adult doing some of the talking. Minority students will be more likely to consider the team if they see and hear adults from different ethnic backgrounds. Another approach is to engage a diverse group of students from the school who have participated on the team to do the recruiting.

Make sure that recruiting efforts will reach a good cross section of the school. It might seem like a great idea to recruit new students from the honor role or from the Science Club, but doing so automatically limits the population of potential applicants. Instead, recruit by targeting the entire school. Put posters up in the school and then hold a student

assembly where there is a FIRST video and a demo. Another approach is to give an overview of FIRST in a series of classes where a cross section of students is enrolled.

The number of students who wish to join the team will likely be more than the team can accommodate. Use a variety of criteria to select the student team participants. Instead of selecting the students with the highest grade point average, use a minimum grade point average such as 2.0 as one of the criterion in the selection process. Other criteria may be a minimum of 90% attendance, recommendations from teachers, etc. Another criterion is to select students who can commit to the meeting schedule (no conflicts with work or sports). Whatever the criteria, make sure it will not exclude all of the students you most want to attract to the team.

When there are more students who meet the minimum criteria for participation than there are spots on the team, it will be necessary to decide which of the students will be invited to participate. Be as objective as possible in the selection.

Engaging a diverse group of adults

Students from diverse backgrounds will initially be more comfortable if there are some adults with whom they can make a connection. Engaging a diverse group of adults that have the same diversity as the student population may prove to be impossible. The diversity in the population of potential adult team members at the corporation or university may not be similar to the diversity in the student population. New adults bring some level of diversity to the team in that there will be fresh ideas, so the act of bringing in some new adults each year will add to the diversity and help keep the repeaters from burning out.

One potential source for recruiting a diverse group of adults is the corporate or university human resource department. Many corporations have programs for newly hired technical professionals. Other sources for bringing some diversity to the adult team population include local chapters of the American Society of Mechanical Engineers (ASME), the Society for Women Engineers (SWE), the National Society of Black Engineers (NSBE), and the Society of Hispanic Professional Engineers (SHPE).

Adult/student relationships

It is important for every adult mentor to remember that there are responsibilities that come with adult/student relationship. Young people look up to people they trust and respect. They will look to the adults they most respect as their role models, so the actions of the adult will be closely watched and be viewed by the student as appropriate behavior. One of the many examples is inappropriate language. An adult may feel he or she is showing camaraderie and will fit in with a group of students by using offensive language that many of the students use among their peers. The reaction of the students may make the adult feel like he or she is part of the group. What the adult has done is to tell the students that inappropriate language is appropriate behavior.

Some school districts have policies regarding adult and student interaction. The adult team leadership should understand these policies, understand how to enforce them, and make sure they are communicated to every adult team member.

Some teams have a meeting with adult team members to set expectations prior to meeting with the students. This can give the adults an opportunity to ask questions they may not want to ask in front of the students. This is an opportunity to openly discuss topics such as diversity and to ask questions the adults may have on working with students. Some school districts have an individual who works with school/business partnerships. This individual could be invited to this meeting to help answer questions that adults may have on working with students.

On many teams adults and students from very diverse backgrounds develop excellent relationships. They learn to work together and have fun together. There is trust and mutual respect.



Resources

Below are resources that FIRST used to make this guide possible. These references are listed for your use.

Web Sites

www.socialpsychology.org

www.teambuildersplus.com/links.htm

www.vta.spcomm.uiuc.edu

www.strategiccomm.com

www.bbbsmanchester.org

www.cyber-sisters.org/mtips.html

www.nwrel.org

www.chiefdelphi.com

www.mentors.net/index.html

www.mentorsforum.co.uk

www.nap.edu

www.americaspromise.com

Publications

Richard G. Weaver & John D. Farrell (1998) *Managers as Facilitators*

Jill Reilly (1992) *Mentorship*

Elaine Anselm, FIRST Robotics Team #191 *A handbook for X-Cats adult team members*