

Student Teaming

Tips

A Handbook for [STEM by Design: Strategies and Activities for Grades 4 - 8](#)

A student teaming guide designed to help STEM teams function effectively



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INTRODUCTION

The ways in which [students] are involved in problem-solving activities is as important to the design of integrated STEM education as the problems themselves.

[STEM Integration in K-12 Education](#), The National Academies

STEM classes feature collaboration and teamwork – 21st century skills that all students need, no matter what their career paths; therefore, preparing kids to work together successfully in teams plays a critical role in today's STEM classes.

Students will work together in teams during each STEM lesson. To be productive, team members will need to understand the value and purpose of working in teams, and develop a sense of being part of a team. They should begin building the skills needed to collaborate successfully and be responsible and accountable for their work.

Setting your students up for successful teaming will help the activities go smoother and increase the learning value for students. Consider three initial tips to get your STEM teaming venture off to a smooth start:

- Make teaming an ongoing part of your classroom practice. This gives students multiple opportunities to develop needed behaviors and skills.
- Set students up in teams ahead of time. On the day of the STEM lesson they should be ready to get in teams and begin work when class begins.
- Provide teaming tips as needed throughout the lesson. Give students opportunities to self-assess their teamwork regularly.

Here, in a nutshell, is a starter set of ideas you may find useful for priming kids to work creatively and productively in STEM teams. As you go about the task of establishing productive student teams in your classroom, you will encounter both obstacles and successes. Be persistent and committed to making teams work, and your students will reap valuable rewards in learning, social skills, and preparation for both life and work.

Step 1: ORGANIZE AND PLAN FOR TEAMWORK (What should I do up front?)

Keep in mind that STEM teams should foster a sense of purpose, creativity, and accomplishment. Team members should recognize that they need one another to solve problems and engineering challenges. Those feelings don't automatically emerge. Planning ahead will set teams up for success as they begin their journey.

Use these tips to help you prepare for successful student teaming.

- **Decide on team sizes that will work best for the particular STEM challenge students will tackle.** Suggested team sizes generally vary in number from two to six, depending on the nature of the engineering challenge. The ideal number is four, since students tend to slack off as team gets larger. When deciding on the size of the team, take a look at the number of tasks team members will need to accomplish for a particular challenge and how many students will be required to do this work. Assign enough team members so that they can get everything done in the allotted time and each team member will have a necessary job.
- **Determine which students will be on each team.** How can you decide what students to place on a team? This is generally a blend of teacher selection, self-selection by students, and an attentiveness to group dynamics and skill sets that teams need to complete the challenge.



Start by identifying what factors you want to make sure are balanced within the teams. Team diversity is one factor that you need to consider. In addition, many STEM teachers strategically assign students to teams based on the skill sets needed to successfully tackle the design challenge. That happens in two ways:

1. *You (the teacher) assign students so that each team has members with the needed skill sets.* Before each lesson, determine what skills students need to complete the particular engineering challenge. Place students on each team who you think can successfully fill those roles. If you do all the selecting, consider inviting team members to rotate roles during the challenge so that they feel they have some say-so in the team process.
2. *Students self-select based on their skill sets.* Another approach (one guaranteed to produce more buy-in) would involve students in identifying the tasks and then choosing one or more tasks they feel most capable of doing. Each of them would

then choose a team who needs a person to perform that task. Self-selection based on skill sets might help to minimize their natural tendency to select a team based only on social relationships. Note: *To self-select, students must fully understand the STEM challenge ahead of time, and tasks must be clearly listed.*

3. *Switch team members from challenge to challenge (or not).* The members making up a team will probably rotate from challenge to challenge, since different STEM challenges may require different numbers of team members. By changing teams, students get to interact with different students and hear new ideas and perspectives. In addition, you may have noticed problems with group dynamics that cannot be solved by leaving team members of a particular team together.

You may prefer the same team members to remain together if they need additional time to develop a smooth way of working. Your overall goal is to develop teams in which all members actively participate and learn together. This [TeachHub post](#) gives 30 different ways to arrange students in teams. Some may be useful to you for STEM team selection.

- **Equip team members with knowledge and skills to successfully accomplish the required tasks.** Look at technical skills students will need for the challenge. During the STEM activities team members may be measuring, weighing, constructing, recording data, and so on. Be sure that one or more team members has the skill and knowledge to do that correctly. If, for example, they will be weighing items using triple beam balances; or measuring liquids using graduated cylinders; or recording data on a computer spreadsheet; be sure each team has a member with these skills before beginning the engineering challenge.
- **Be sure students have the science and math background they need to solve the challenge.** What science and mathematics content will students need in order to complete the project? Students should work from a solid knowledge base and understand how to apply appropriate science and math content (and other subjects as needed). As they work through the challenge, make intentional connections between the science and math, and the STEM tasks they are doing.



- **Be sure the materials that teams will work with are available, organized, and set up for easy access.** Set up the room and the materials in advance to keep teams moving more smoothly through the STEM activity. Decide whether it would work best to put these materials together in a set for each team. Also decide which materials will need to be replaced after each class if more than one group of STEM students are doing the same challenge. What will clean-up involve after each lesson, and what materials should teams leave for the next class? What process will team members use to gather, return, and/or dispose of materials as they work? (Be sure to have several places available for kids to get rid of trash during projects.)



Step 2: INTRODUCE A TEAMWORK RATIONALE. (Why are we working in teams?)

Help students consider the value in working together. The more information you can share with students about the value of teamwork, the better. To help them see the importance of good teamwork, ask them to think of some examples of people working in teams. (Athletes, lawyers, medical staff, NASA, and engineers, for example.) Ask students to think about what might happen if football players practiced individually but never practiced as a team before a game. How would the game likely turn out?

Share other teamwork bonuses with them at appropriate times before and during their engineering challenge. For example, working together in teams can help students develop a host of skills they will need in any profession. The ability to work through problems, consider other points of view, cooperate, and successfully communicate are just a few of these. Moreover, *good* teamwork can help students learn and retain information better than isolated learning. For more information on the value and importance of team work, type “benefits of teamwork” into a search engine.

Step 3: ESTABLISH A PURPOSE FOR THE TEAMS' WORK. (What should we accomplish?)

Any student teams you form during the school year will need a clearly defined identity and purpose. At the beginning of each STEM challenge, clarify the function of the student STEM teams. Professional engineers work together to develop solutions because they each bring a different set of skills and expertise to a project. Student engineers will also

use each other's expertise to make decisions and complete the projects in the STEM lessons.

Clearly define the goal and outcomes for the team's work. Students work together more successfully and learn more when they have a clear goal to keep them focused. Each STEM lesson should clearly define the purpose for the teams' work – what the challenge involves and what problem the teams will be creatively solving. Share that information with students. I like to plan an engaging method of introducing the goal to teams, such as a video or a skit establishing the need for a solution to the particular problem.

Expected outcomes should include what the team will produce or design to solve the problem. Will they be creating a "wind catcher" that generates enough energy to power a particular device? Will they be designing and constructing a lunchbox that keeps food warm for a certain period of time? The primary outcome for a STEM challenge is usually an inventive prototype to solve the problem being addressed.

To verify that students understand the team's purpose, ask them to explain to you what challenge or problem they will be solving, and what the outcome of their work should be. Encourage team members to ask questions and clarify expected outcomes.

Step 4: ESTABLISH TEAMWORK PROCESSES (How will we work as a team?)

Team members need to know how to make their work successful. They will be learning this throughout their team experiences, with strong guidance from you as needed. Make certain students have answers for these questions:

- What should we work on as a team?
- What should we do individually?
- How long should our work take?
- What specific procedures should we use to accomplish that?

Some STEM lessons may include guidelines for team members. These guidelines generally help them understand how to stay on task and focused on what they need to accomplish. Be thoroughly familiar with the procedures before leading this STEM challenge, and make sure team members understand them.

To help them understand how to proceed in getting their work done, write the procedures on the board (or other type of display), or provide handouts. Include instructions about how to set team norms (see Step 5). Guide them to consider what particular behaviors they might see in successful team members, what to do if they

encounter team difficulties, and so on. They might establish team roles if they already know their challenge, or do a getting-to-know-you activity if they are not well acquainted as team members.

All team members should be actively engaged in learning during the project. Ideally you want the teams to create opportunities for all members to engage with and regard other members as capable and contributing members of the team. That means being able to help teams over bumps and guide them in developing collaboration skills. Keep reading.



Step 5: DEVELOP TEAMWORK SKILLS (How will we hold it together?)

Work on developing teamwork skills over time and during many lessons. You might focus each STEM lesson on helping students develop a different teamwork skill. Some skills you might focus on include showing respect, accepting differences, active listening, staying on task, accepting responsibility, maintaining positive attitudes, showing respect, and

so on. A couple of other ideas:

- *Guide teams in setting norms.* Teams work better when all members have a common understanding of what they value in one another as team members. If team members do not intentionally set guidelines for helpful behaviors, then unhelpful behaviors emerge by default. Setting good norms produces more positive interactions among team members and helps them regulate their behaviors.

To generate thoughtful buy-in, norms should be specific to each team and set by that team's members. Use the "*What Matters to Our Team?*" tool at the end of this document to help teams set meaningful norms to help their teams run smoothly. If they do not include guidelines for how team members will talk to one another, listen, and share responsibilities, make suggestions to guide them in that direction.

- *Build interaction skills.* Students won't necessarily enter your class with the skills they need to engage productively in teams, so plan to provide guidance and structure as they work through team dynamics issues. The "*Productive Conversations*" tool at the end of this document can help to structure conversations and positive interactions among team members. You may choose to use some of these strategies during regular lessons in your class as well as during the implementation of a STEM lesson.

Giving students experience with holding productive conversations will build success for teamwork during STEM lesson activities.

Some ideal interaction skills for effective teamwork include those listed in the "*Super Smart Team Skills*" handout. You might use this as a checklist to keep track of what your students seem to do well and areas where they need guidance. Or, teams may use this to analyze their own social skills as a team. This will keep them aware of how successful team members interact.

- *Use self-assessments to help students improve their teamwork skills.* Self-assessments can help students understand how team members should ideally work together. Allow some time during the lesson for team self-assessments. The "*Super Smart Team Skills*" tool serves as a team self-evaluation. The "*Self Evaluation*" and "*Team Evaluation*" handouts may also be used as team self-assessments. Students could do these as individuals or as a whole team. Remember that the purpose of these assessments is to help students identify areas where their personal skills can improve and areas where their team should run more smoothly. With this knowledge in hand, they can decide on ways to address these. To encourage honesty and transparency, avoid using the self-assessments for grading.

Step 6: MONITOR TEAMWORK (How will we know we are doing this right?)

Regularly monitor teams and provide productive feedback during every STEM lesson. Walk around the room to check on each team's progress. Generally, you'll need to limit the time you spend with any one team so that you can observe and assist all teams. If a team needs you to spend more time with them, try to get them to a point where they can work alone for a few minutes while you check in with other teams. Then return to that team and help them with the next step. If you find that several teams are struggling with the same problem, pull the teams together for a few minutes to clarify the issue before returning to their teamwork. The "*Super Smart Team Skills*" handout can help you identify behaviors you are seeing in teams as well as behaviors you would like to see.

Step 7: CHECK TEAMWORK PROGRESS (Are we there yet?)

Regularly collect student feedback on how effectively teams are working. When walking around, you might make a note of such things as

- What kinds of team member interactions went well today?
- What skills have team members mastered well?
- How engaged are team members in doing the work?

Leave enough time at the end of class to debrief. Give team members the opportunity to reflect on the quality of their contributions to the team, address their team strengths, and identify opportunities for improvement. As much as possible, give team members individual feedback on the quality of their contributions to the team.

Above all, do not underestimate the importance of the teamwork component of STEM. Perhaps the greatest advantage that teamwork brings is the quality of the finished product. A team brings together the combined skills, talent, and experience of all team members. In a well-functioning team, the team experience inspires members to greater achievement, and generates ideas that otherwise would not happen.

As you go about the task of establishing productive student STEM teams prepare to face some daunting obstacles as well as successes. Be persistent and committed to making those teams successful. It's worth your time to help students engage in focused, systematic teamwork to find solutions. In return your students will gain valuable abilities in learning, social skills, and preparation for life and the 21st century workforce.

Note: Should you be interested in personally learning more about teamwork basics, you will find useful information and tools in my book, [Team to Teach: A facilitator's guide to professional learning teams](#). Although this guide is written to establish fully-functioning teacher teams, the principles apply to student teams as well. Many of the tools in the book will also be useful.

What Matters to Our Team?

To the team members: Follow these directions and decide on some useful team norms (guidelines) that will help you work together smoothly as a STEM team.

1. Grab some sticky notes and a pen or pencil.
2. Think of a time when you worked in a group or team. On each sticky note list a behavior you value in other team members during meetings. (List each behavior on a separate sticky note.)
3. Share the behaviors you value with your team and place your sticky notes so others can see them. If you listed the same behavior as someone else, place your sticky note on top of the behavior it matches.
4. When everyone finishes sharing, talk about the behaviors that team members value. Which ones are the same?
5. Agree as a team on about 5 or 6 behaviors you all want to see happen on your team. List those below.

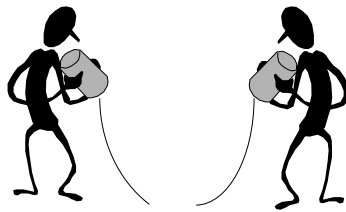


Six helpful behaviors we want to see on our team.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

Let these behaviors become your norms. As you work together, you will probably realize that you need to add to them, or even change them. Please do that.

Productive Conversations



To the teacher: This strategy can help team members discuss an issue efficiently and reach a decision. This works particularly well when students have some degree of emotional engagement with the issue. In each team, one person is selected as the leader. After the issue is explained or clarified (or after students read about the issue), the leader asks four questions.

1. **What are the facts about this issue?** Team members can share *only facts* at this point. They do not get into how they feel about the issue or what their suggestions are at this point.
2. **How do you feel about this issue?** At this time, team members can share their feelings about the issue (*and only their feelings*).
3. **What implications does this issue have for . . . us as a team, our project, the class, our invention, etc.?** Students discuss *only the possible impact and implications* the issue has on their engineering problem and/or solution.
4. **What decision can we make, if any?** Team members discuss what they might be able to do about the issue and make a decision. At the conclusion of the activity team members share their decisions with the whole group.

Super Smart Team Skills

To the team member: Below you will see some ways that super smart team members work together with one another. Use this as a checklist to keep track of what your team seems to do well, and areas where your team may need more guidance.

Directions: Discuss these skills as a team. How well does your team do these? Beside each skill, place a checkmark in the appropriate box.

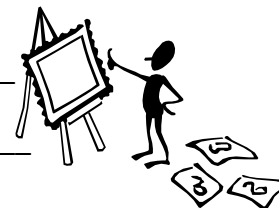


Super Smart Team Skills	We do this well now	We need to do this better
1. We follow the directions.		
2. We ask for clarification when needed.		
3. We stay on task.		
4. We remain with our team at all times.		
5. We all participate in discussions and activities.		
6. We listen carefully to what others say.		
7. We accept responsibility and each of us does our job.		
8. We share responsibilities equally.		
9. We share materials and supplies.		
10. We keep our voices down and speak quietly.		
11. We call each other by name.		
12. We accept differences in one another.		
13. We maintain positive attitudes.		
14. We each show respect for other team members.		
15. We cooperate with one another.		
16. We praise and support one another.		
17. We are good sports.		
18. We ignore distractions.		
19. We all interact with everyone on the team.		
20. We use self-control while working on the project.		

Team Member Self-Evaluation

To the team member: Think about yourself as a "team player." Look back at your role on the team and fill out answers for this form.

What were your responsibilities as a team member? _____



What did you do well? _____

What would you do differently if you had another chance?



Team Evaluation



To team members: Discuss these answers together and write down what team members decide as a group. Use another page or the back of this page if needed.

1. How would you describe your group's teamwork?
2. What do you like best about the way your team worked?
3. What do you like least about the way your team worked?
4. How do you think your team can improve?

What's a Teacher to Do?

To the teacher: This handout provides suggestions for supporting student STEM Teams. How would you put some of these ideas into action?

WHAT?	HOW?
1. Understand what a fully functioning student STEM Team looks like.	
2. Promote students' belief in the benefits of working together on STEM lessons and in their ability to do this successfully.	
3. Arrange your class schedule to allow time for students to practice a particular teamwork skill. This may be in any class, not just a STEM class.	
4. Be aware of students' levels of commitment. Support full, active participation by all students.	
5. Involve students in making decisions about their teams where appropriate.	
6. Ask other teachers to join you in promoting student teamwork in their classes. Be sure you are all on the same page with what the teamwork should involve.	
7. Provide rewards and recognitions for teams rather than for individual students.	
8. Provide gestures of appreciation (a surprise basket, supplies, coupons, etc.) for teams from time to time. Remove a homework duty one day.	
9. Give students cards telling them they have permission to take risks and try new teaching approaches.	
10. Give student teams high visibility school wide.	
11. Provide regular and productive feedback to teams.	
12. Maintain a strong, observable commitment to Professional Learning Teams.	