CHAPTER 3

How Can I Make Argumentation in the Classroom Productive and Support Deeper Learning?

Establishing Classroom Norms

(The following section has been taken from the work of Catherine O'Connor, Erin Ruegg, and Sara Michaels and their work on academically productive talk. We are grateful for their permission to reproduce what is some of the best advice on establishing a dialogic classroom where talk is taken seriously.)

Most teachers set behavioral norms for their students at the beginning of the year. Often these are posted: "Be respectful," "Show effort," "Come prepared to work," and so on. We have learned from many teachers that productive academic talk actually requires an additional set of norms: norms that are designed to support you and your students in using discussion and debate.

What is required to have an academically productive discussion? For all students to benefit from a discussion you need to ensure that *all students participate*. This is not easy. Several big factors have to be in place to get all students to participate.

First, the classroom context needs to be *respectful.* If discussions descend into people talking over one another, personal attacks, or hostility, you will not succeed in getting students to participate. They won't feel safe, and many of them will just keep silent, rather than invite ridicule or disrespect. This is why we strongly advise starting with some of the strategies that separate the person from the idea and help students to feel safe.

Second, discussion must be *equitable*—that is, all students should be encouraged and given opportunities to participate. Discussion is not just for the few students who always want to talk or for the few academically strongest students. It must also include those who are shy, those who feel unsure of their abilities, those who have more difficulty with the content, and English language learners.

Finally, it is really important that all students *can hear and see one another*. This may sound totally obvious, but in many classrooms, this is not a trivial problem. The acoustic conditions in many older school buildings are not good. In elementary grades, there is usually a carpet or rug area where students can sit in a circle, and this guarantees that even quiet students can be heard. But in middle schools, there may be problems. If every student is seated facing the teacher, it will be difficult to hold a really productive discussion, even if everyone can hear fairly well. This means that you should think of altering the classroom configuration so that people are at least turning inward and to face each other.

How to Start and What to Include

The capacity for good discussions in classrooms is developed over time. Establishing and developing a shared understanding of expectations for discussion is the first step. Just as sports teams

depend on shared expectations for interactions on the field, students must understand and adhere to the expectations you have of them to interact productively in a discussion.

Establish Your Norms

Introduce and develop *discussion norms* with your students. Consider how you have introduced more general behavioral norms in your classroom. If these methods were successful, you should certainly try adapting them for introducing discussion norms. However, at first discussion norms may be more complex than other norms, because discussion itself will be new to some students. Some students are not used to talking about their ideas. They may find it difficult to feel safe in expressing their views. They may not feel entitled to respond to others' views.

On the other hand, you may have students (even if there's only a few) who feel perfectly comfortable talking about their own views and critiquing the views of others. This may have a negative effect on the participation of those students who are not used to sharing their ideas.

Therefore, setting up norms and allowing students time to practice and develop productive discussion *are really important steps* in a process. We strongly encourage you not to have a full-blown discussion or debate until you and your students feel confident with classroom discussion norms. Rather, try out one of the other participation activities we have suggested in Chapter 2 where students can discuss ideas in smaller groups and where the idea is separated from the person.

What Should the Norms Include?

You might start the discussion by talking about something fairly straightforward. If we're going to have *discussions* about our work, we need to make sure of several things:

- Everyone has a chance to participate.
- Everyone feels that they will be respected.
- Everyone can hear what is said and see who is talking.

You can ask students questions about these principles to get their ideas:

- What might get in the way of your participating? How can we make sure that everyone gets a turn?
- What might make someone feel disrespected? How should we deal with that if it happens?
- How can we make sure everyone can hear, when some people have very quiet voices?
- Create a chart of norms with your class. Let students participate in describing what a good discussion will look like, sound like, and feel like. This will help them to visualize an ideal setting with themselves contributing with successful talk. The following are three examples created by teachers who have succeeded in creating conditions for consistently productive discussion.

Examples

Here are three different ways norms can be developed and displayed as wall charts or printed out on sheets for student binders, or both.

The "Green Sheet"

This is a set of norms agreed upon by a fifth-grade class. The teacher printed these out on green paper, and had students put them in a binder. The green sheet was a tool for developing discussion and a reference once students and teachers became confident with using argumentation and discussion in their classroom (see Figure 3.1). Yours may be similar or may differ.

FIGURE 3.1 Green Sheet

An electronic copy of this figure is available on the companion website at https://resources.corwin.com/OsborneArgumentation.

Students' Rights

1. You have the right to ask questions.
2. You have the right to be treated respectfully.
3. You have the right to have your ideas discussed, not you personally.
4. You have the right to be listened to carefully, and to be taken seriously by your classmates.

Students' Obligations

1. You have a responsibility to speak loud enough for others to hear.
2. You have an obligation to answer questions seriously.
3. If you cannot hear or understand what someone says, you have a responsibility to ask them to repeat or explain.
4. You have an obligation to treat others with respect.
5. You will be called on to discuss other people's ideas, to agree or disagree, and to explain your reasoning.

Student and Teacher Wall Chart

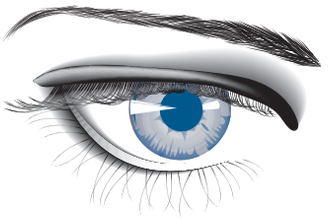
In the next example, students and teacher work together to create a wall chart about norms that reflect their own guidelines for a productive discussion (see Figure 3.2).

The teacher holds a discussion to generate answers to the questions in the poster:

- What does discussion in our class look like?
- What does discussion in our class sound like?
- What does discussion in our class feel like?

As a whole-class activity, the group then develops consensus statements, and these are written on the poster to use as norms going forward. As discussion skills are developed in the classroom, the chart is used as a reflection tool that can be added to throughout the year.

FIGURE 3.2 Student and Teacher Wall Chart



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Norms in Progress

In the third example, from an eighth-grade class (special thanks to Liz Berges), yet another approach is taken. These norms are developed over time, not all at the beginning of the year. Every few weeks, the teacher holds a discussion and the group decides on a new norm, based on their experience with discussion up to that point. In this group, we see many of the issues mentioned earlier, but in addition, there is a concern with *authentic* discussion and an emphasis on responsibility for one's own learning. This is appropriate for eighth graders and shows that this teacher is in tune with her students' developmental stage and growing intellectual capacity.

Discussion Norms

1. We come *prepared* for discussion with examples, stories, notes, and text.
2. We are active participants responsible for our *own learning*. This means we
   speak,
   request clarification,
   show agreement or confusion,
   verify, and
   ask others to repeat.
3. We strive to have *authentic* conversations that are *academically rich*. This means we
   use target vocabulary,
   stay on topic, and
   ask what we really want to know.
4. We push ourselves *and each other* to think beyond the obvious, popular, or easy answers. This means we
   request proof or reasoning,
   point out misinformation,
   disagree with parts,
   draw others out, and
   are open to changing our minds.

Practice and Develop

As you develop these norms with your students, you may want to provide opportunities for students to develop a shared meaning of these norms. Some ways to get used to these discussion norms outside of an actual discussion include the following strategies:

- **Act it out.** In small groups or with partners, students can dramatize discussion scenes where norms are being compromised. The class can try to guess which norm is not being followed, and the team can correct themselves. *For example, students can "interrupt," not listen, forget to use evidence from the text, attack a person instead of the person's idea, or let their talk wander into an unrelated tangent.*
- **Make a class-created rubric.** Create a rubric with your class for each norm. Make the descriptions of acceptable participation clear and concise, letting students offer and contribute language as you write them. Ask regularly about the success of discussions and debates using the rubric as a reflection tool.
- **Create a class book.** Let student teams illustrate and describe a norm on paper. Use student work to compile a book. Use a plastic binding and keep the book in your classroom library.

Just as practicing a sport is essential to becoming a great player, as your students *practice* these norms and goals, they will become great participants in discussion. As you hold your first discussions, students will need help in practicing the norms. These are some of the rules that you will need to follow.

Be consistent. As soon as the rules are established, as the teacher and leader of the classroom, you are responsible for making sure they are understood and used well. Practicing norms and referring to them before, during, and after discussions will elevate their significance and improve student ownership of the discussion goals.

Don't tolerate disrespect. If you have a successful behavioral system in place, with sanctions and/or incentives, use this to enforce the norms. Many teachers have found that it's important not to tolerate disrespect in discussions. If students are afraid they will be ridiculed or put down, even in a subtle way, they will just stop contributing—*sometimes for the entire school year!* So make it clear from the beginning that you won't tolerate even minimal signs of disrespect: a "tsk" or an eye-roll can really undermine your success. Make it known what the consequences will be and then be consistent in your enforcement.

Note, however, that *you* are the final arbiter of what is acceptable behavior. Some classes have a greater tolerance for humor, intense conversation, and other things that might be unhelpful at a lower grade level or in a situation with other conflicts going on. Use your judgment and continue to monitor.

Stop everything. When students are interrupting one another, straying off on tangents, not listening to one another, or not being respectful, it is time to stop the discussion. By letting it continue, you are actually sending a message that these behaviors are okay. Stop, gather students, and ask them what they were doing well and what needed to be better. Ask them to refer to the written version of the norms, whether it is a wall chart or a "green sheet" in their binder. This may seem disappointing and time-consuming at first, but in the long run, it will be a huge time saver and skill builder.

Reflect on your norms. Provide time to reflect about students' use of the norms. Just as sports team members reflect and review game highlights, it will help you to build in time to *reflect* with your class on how your discussions are going.

- Take time! As simple as this sounds, time in a classroom can slip away very easily. Leaving time at the end of a discussion or debate to reflect on the class adherence to norms and development as a team is never time wasted! In fact, this kind of reflection is essential to keeping your posted list of norms a dynamic and significant document in your classroom.
- A useful reflection can be done in 1 to 5 minutes. You can reflect with a short discussion, voting by holding up one to four fingers or using high, medium, or low thumbs. Encourage students to reflect on their own behaviors as well as those of others and to consider their own strengths and weaknesses in the discussion.

Productive Talk Moves

Discourse in the classroom is notoriously dominated by a sequence that is called initiation, response, evaluation (IRE). This is where the teacher asks a question—something that in itself is strange since, in normal discourse, it is the person who does *not* know the answer who asks the question. Overwhelmingly, this question is a closed question in that it is looking for one very specific answer. This elicits a short, phrase-like response from a student. Generally, this is a small subset of students who are confident enough to believe they have the right answer. This is then followed by an evaluative comment about whether the response is correct. This form of discourse is so familiar to students that it is reduced to a game of guessing what is in the teacher's mind. Moreover, it tells you, the teacher, little about how much the idea has really been understood.

The primary function of what is really a rather perverse form of discourse is to make the correct idea public—all the students get to hear what they are supposed to know. However, there are many criticisms of it as a form of dialogue that will support learning. First, research shows that teachers rarely wait longer than a second for an answer. Moreover, if they can train themselves to wait more than 3 seconds, the length of student responses increases considerably (Rowe, 1974). These findings, while old, have been replicated so often that you wonder why this is not firmly embedded in teachers' practice. Perhaps it is rather like the educational equivalent of washing your hands in hospitals—everybody knows that you should do it but laziness lets them down?

Second, the discourse is rarely equitable in that it is a small subset of students who commonly answer the questions. In particular, girls often lose out. Finally, what counts as an acceptable response is often a short phrase or one-word answer. However, if we want students to appropriate the language of science, there has to be a practice that encourages longer answers and more extended use of scientific language. In short, the goal is to move from Model A, shown in Figure 3.3, to Model B.

FIGURE 3.3 Two Types of Classroom Discussion

MODEL A	MODEL B
TYPE OF TALK	
Brief answers	Longer, more elaborate answers
• in teacher's language	• in student's language
DISCUSSION DYNAMICS	
Student responses are characterized by unrelated bits of information	Student responses are part of ongoing, connected discussion
Little student engagement	High student engagement
Product orientated	Process orientated
All questions teacher initiated	Some questions student initiated

How, though, is the question you might ask? One obvious way of changing the structure of your classroom discourse is to use any of the group participation structures that we introduced in Chapter 2. Here students have to talk to each other. However, if you are going to use whole-class discussion, then we strongly encourage the following types of questions—called productive talk moves (Resnick, Michaels, & O'Connor, 2010). The feature of all these questions is that they are open-ended. There is no one right answer. Because of that, they enable a range of possible answers and avoid putting you the teacher into the position of having to make an evaluative comment. These questions fall into four categories, described in the sections that follow.

Questions That Encourage Individual Students to Share, Expand, and Clarify Their Own Thinking

1. *Say more:* "Can you say more about that?" "What do you mean by that?" "Can you give an example?"
2. *Verifying and clarifying by revoicing:* "So, let me see if I've got what you're saying. Are you saying. . . ?" (always leaving space for the original student to agree or disagree and say more)
3. *Wait time:* "Take your time; we'll wait."

Questions That Encourage Students to Listen Carefully to One Another

4. *Who can repeat?* "Who can repeat what Javon just said or put it into their own words?"
5. *Explaining what someone else means:* "Who can explain what Aisha means when she says that?"

Questions That Press for Deeper Reasoning

6. *Asking for evidence or reasoning:* "Why do you think that?" "What's your evidence?" "How did you arrive at that conclusion?" "How does your evidence relate to your claim?"
7. *Challenge or counterexample:* "Does it always work that way?" "How does that idea square with Sonia's example?" "That's a good question. What do you think?"

Questions That Press Students to Apply Their Own Reasoning to That of Others

8. *Add on:* "Who can add onto the idea that Jamal is building?"
9. *Agree/disagree and why?* "Do you agree/disagree? (And why?)" "Are you saying the same thing as Javed or something different, and if different, how is it different?"

If you want to see examples of teachers using these approaches, then we recommend looking at the resources that are available on the TERC Talking Science website (http://inquiryproject.terc.edu/).

What if My Students Convince Themselves of the Wrong Answer?

One of the major concerns you may have is a view that your job is to get students to understand the correct scientific idea. Getting them to discuss ideas that are flawed or incorrect is, you may think, first a waste of time, and second, students may convince themselves of the arguments for the incorrect scientific idea! Both of these are legitimate concerns.

First, we would admit that teaching in which you talked students through the standard scientific explanations one after another would be faster. However, the overwhelming body of evidence would suggest that *as a learning activity,* it is largely a waste of time. Just presenting information, however clearly, is as one commentator once remarked, "a practice by which the notes of the lecturer become the notes of the student without going through the minds of either." Research shows that if you want students to understand the ideas they are being taught, there is a hierarchy of learning activities, with activities that require students to be "interactive" being more effective than those that are "constructive," which, in turn, are more effective than those that just require the student to be "active" (Chi, 2009). What are the features of such activities?

Interactive (most effective activities). Being interactive is when a learner interacts with a peer through discussion and debate and when both students make substantive contributions to the topic or concept under discussion, by building on each other's contribution, defending and arguing a position, challenging and criticizing each other on the same concept or point, and asking and answering each other's questions. Generally, a feature of this kind of learning is that the learners are generating knowledge that goes beyond the information given in the learning materials.

Constructive (less effective than interactive activities). Constructive activities require the student to produce some sort of overt outputs, such as explanations from self-explaining, notes from note taking, hypotheses from inducing, questions from question asking, predictions from

theories, concept maps from drawing, and self-report assertions such as "I don't understand" from formative assessment. A second characteristic of constructive activities is that they tend to ask learners to produce some outputs that are not contained or presented in the learning materials. That is, they do not require them just to summarize ideas from a text.

Active (less effective than constructive activities). Being active is the requirement that the student is doing something physically. This could be manipulating laboratory equipment, underlining or copying and pasting some parts of a text, filling in the blanks in a piece of text, copying problem solution steps, summarizing paragraphs by annotating the text, selecting from a menu of choices, and so forth.

Essentially, learning requires a student to engage in the cognitive acts of defining, describing, explaining, explicating, arguing, and predicting. Listening to a teacher or just watching him or her demonstrate a phenomenon makes very few of these demands, which is why rushing students across the scientific landscape results in very little learning.

So to the next question: What if students emerge from their discussion more strongly convinced of the nonscientific answer? Isn't this running the risk of failure to achieve the goal I am charged with? The honest answer is "yes" only if you yourself are not convinced that you can ultimately argue the scientific case. After all, if the canonical scientific explanation is accepted by all and sundry, then as a teacher of science, we ought to be able to make the case for it. This means that you may well be called on to make the argument as devil's advocate and to counter fallacious arguments that seem superficially convincing. How, for instance, would you argue with a student who said the following:

- Day and night must be caused by a moving Sun as the Sun moves from east to west during the day.
- Plants must get their "food" from the ground as why else do they have roots and why else do you water them?
- Clearly gases do not weigh anything. There is nothing there and we don't feel anything when we walk through it.

Research shows that knowing the counterarguments to these types of arguments makes you a more effective teacher (Sadler et al., 2013). Moreover, what it means is that you are saying to students that the reason I am asking you to believe these ideas is not just because I, the authority on these matters, am telling you they are true, but because there is evidence for my ideas and evidence that your ideas are flawed. Asking students to hold ideas that they cannot justify to others is ultimately poor currency for them, and students deserve, from time to time, some insights into how and why science has come to know what it knows.

Clearly, we do not have time to go through all the evidence for the many ideas we present. It took years to build such ideas and some of the brightest minds in the first place. But we can do it from time to time. After all, the statement that somebody "knows some science" is a statement not only about what a phenomenon is and why it happens but a statement about how it relates to other events, why it is important, and how this particular view of the world came to be.

Finally, if we do really believe that learning science develops the ability to reason like a scientist, then this is only going to happen if we give students the opportunity to do just that—argue from evidence. Not only does it do justice to science, but it also does justice to students—asking them to think, which they too find more engaging.

Where to Go From Here?

This book can only be a start to the process of building your expertise as somebody who makes greater use of argumentation and dialogue for learning. We would be the first to acknowledge that good teaching is a highly complex activity. As a teacher, you are forced to respond to a context that is constantly challenging and changing, and this requires expert professional judgment.

Such expertise emerges through many hours of practice and learning from others. What this book offers is a set of activities around which you can start to develop your expertise with argumentation in the science classroom. Developing your competency further means attending professional development, working with other teachers, and exploring other resources. A good starter is the TERC Talking Science website (http://inquiryproject.terc.edu/prof_dev/pathway/). The reward for improving your capability is the satisfaction that comes from teaching science in a manner that students begin to understand and find engaging and where they enjoy learning. We hope that this book offers you a way of beginning or adding to your expertise and would, of course, welcome any feedback that might improve our suggestions and ideas!