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Strategies for Supporting Equitable Group Work

Marta R. Stoeckel ; Kelly O'Shea

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Strategies for Supporting Equitable Group Work

Marta R. Stoeckel, North St. Paul–Maplewood–Oakdale Public Schools, North St. Paul, MN
Kelly O'Shea, Little Red School House and Elisabeth Irwin High School, New York, NY

Science is a collaborative activity, making group work an important element of many science classrooms.[1] However, group work is also frequently a source of inequity, especially when there is minimal structure.[2] The ways students interact during group work are shaped by status, which students assign based on factors including perceived ability, race, gender, economic status, and even perceived social savvy.[3,4] The choices that we make as teachers about when, why, and how students work in groups, how and what students learn about working in groups, and even the composition of those groups has the potential to disrupt—or perpetuate—social power dynamics, ideologies, and hierarchies that shape status. In this article, we will share some strategies for structuring and facilitating group work that disrupt status and promote equitable participation.

We are both white women and experienced high school physics teachers, though we teach in very different settings. Kelly O'Shea teaches at a progressive, independent school in Manhattan, teaching required introductory physics to all 10th graders in untracked (meaning only a single physics course is offered) classes of 16–18 students. Marta Stoeckel teaches at a large public school in a suburb of St. Paul, MN, teaching introductory physics and AP Physics 1 to 11th and 12th graders in classes of 25–35 students where students select either physics or chemistry to meet a graduation requirement. Kelly's school is predominantly white, whereas over half of the students at Marta's school are Black, Indigenous, or other students of color. While we teach in different settings, we see similar patterns at play in our classes and have found similar strategies useful in addressing issues of status.

Planning for group work

Equitable group work starts in the planning stages of an activity. Students will have the most need to collaborate effectively when they are given what Lotan[5] calls a group-worthy task. She describes a task as group-worthy when it

- Is open ended.
- Has multiple entry points and ways to demonstrate competence.
- Addresses important disciplinary content.
- Has a balance of interdependence and individual accountability.
- Has clear criteria for success.

While it is extremely challenging to design a group-worthy task from scratch, many different types of existing activities meet these criteria. Many card-sort activities[6] meet these criteria, as do open-ended labs, including lab practicals and guided inquiry labs. Challenging problems—such as those in *TIPERs: Sensemaking Tasks for Introductory Physics*[7] and context-rich problems[8]—also work well as group-worthy tasks. Students can approach each of these activities in multiple possible ways, which creates multiple entry points. These tasks are also challenging for students to complete individually, creating a need for the group. In cases where students have shared materials, such as a lab, a card sort, or when students are doing a problem on a whiteboard, interdependence also comes from the need to agree on a single approach.

Once we have a group-worthy task, we determine how we will group students, which has important implications for the group's function. One common strategy is to group students by perceived ability. While this approach may allow the teacher to focus on supporting particular students, it reinforces status since students often recognize that they are in the "low group" or are the "smart kid" in a mixed group.[3] Another common strategy is to avoid isolating students with a marginalized identity, such as ensuring that girls are always the majority in a mixed-gender group.[8] While this approach has benefits, it can also have unintended consequences. For example, girls are more likely to share their ideas in single-gender groups than in mixed-gender groups, but engage in less scientific reasoning since their ideas are challenged less often.[9] We recommend visibly random, frequently changing groups, where students get a new group (formed in a way that students can see is random) for each class activity.[10] This approach avoids reinforcing status by communicating that every student is capable of working with anyone else in the class and that any combination of students will have useful skills.[11] There are nearly endless ways to create visibly random groups, but we have listed a few options in Table I.

Table I. A few strategies for forming visibly random groups.

Strategies for Forming Visibly Random Groups
Copy the class roster into a random number generator, such as random.org
Put the class roster into a spreadsheet such as the one at bit.ly/GroupGenerator
Hand out playing cards and have students find peers with the matching number or suit
Put student names on popsicle sticks and draw sets of names
Use online group makers like flippity.net/rp.php

Group-work strategies

Once students are in groups, it is important to teach them how to collaborate effectively and to provide structures to support their development of those skills.[12] We have found several strategies especially useful. All of these strategies come back to the question of what messages we are sending to students about their status and what we value in our classrooms. Each of the strategies here is intended to communicate that we believe every student is capable of making valuable contributions to their group and that every student will benefit from collaborating with their peers.

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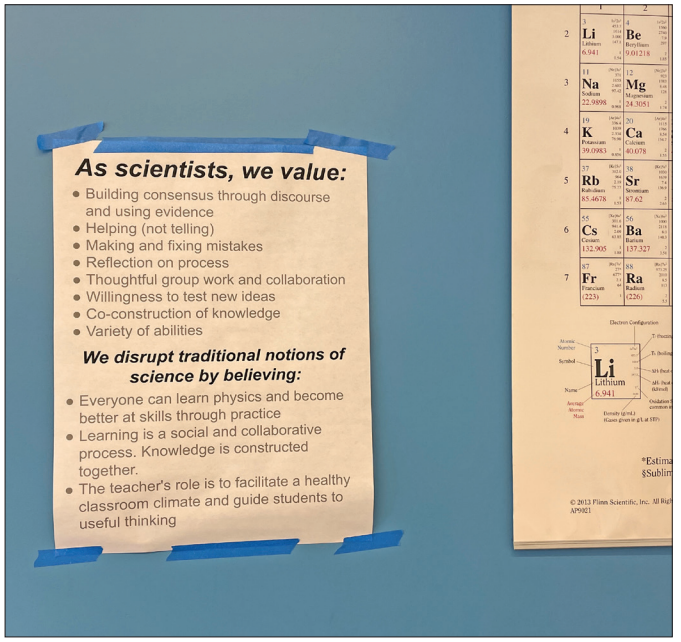

Fig. 1. A poster of beliefs and values from Kelly O'Shea's classroom.

Strategy 1: Make beliefs and values explicit

Teachers and students all have values and beliefs that shape the actions we take in the classroom and drive the ways students interact in small groups. For example, a student who believes they are innately good at physics may dominate a group where they do not see their peers as having a natural ability. A student who values knowledge from authority may be passive during group work since they do not expect it to be a meaningful source of learning. Explicitly discussing the values and beliefs we and our students bring into the classroom gives students the opportunity to challenge their existing conceptions and consider what they would like to aspire to and what actions align with their aspirations.

Kelly O'Shea developed a lesson that we use 2–3 months into the school year.[13] This gives us some time to start to establish a class culture, let students experience physics learning, and indirectly communicate our own beliefs and values about learning—all of which gives students important context for the lesson. Students first read and discuss a brief article on how many groups of people have been excluded from what we think of as science, then students reflect on the conceptions of physics they have learned through pop culture. Students next do a card sort where they identify whether particular beliefs and values align with a traditional view of science or a view of science that is built by everyone. Students finally identify several beliefs or values they aspire to that we combine into a class set of values and beliefs that we post in our classroom, such as the poster in Fig. 1.

To help students translate their aspirations into action, the day after the activity we share some of the class values and beliefs that resonate with us as teachers and discuss how we enact those values and beliefs. For example, our students often select "learning happens through making and fixing mistakes" as a belief, and one way we enact this belief is by incorporating retakes into our assessment practices. We then regularly ask students to reflect on the actions they are taking to live up to their aspirations and how they can better strive for their ideals.

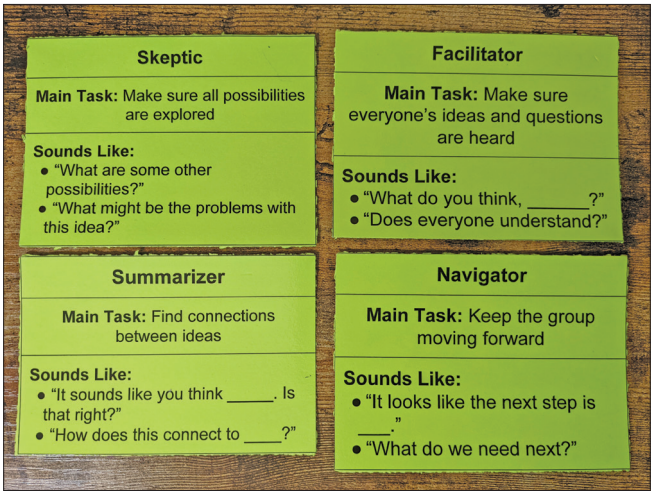

Fig. 2. Group role cards.

Strategy 2: Group roles

Group roles provide a valuable way to communicate what effective collaboration looks like. We primarily use group roles at the start of the school year when students are first building relationships with each other and learning how to collaborate effectively in physics. While some students are able to figure out the effective ways of collaborating represented by the group roles, making these ways of interacting explicit gives every student the opportunity to develop these skills. We use group roles adapted from Heller and Hollabaugh[8] that we print onto cards students can have in front of them during collaborative activities, shown in Fig. 2.

There are several features of these roles that we find appealing. First, no role has explicit status since none of the roles are "in charge" of the group. Second, these roles focus on how students are engaging with each other's ideas, rather than how the group splits tasks. Students tend to be more comfortable and familiar with splitting tasks, but typically learn more and have more equitable participation when they are pushed to share tasks and engage with their peers.[14] Third, we intentionally used questions for most of the sentence starters for these roles. This is a way of emphasizing that students do not need to have an answer to make a useful contribution to their group.

Students do not need to take the roles seriously or to carefully abide by them for the roles to have a positive effect. When a group is struggling, we find that students who have not been previously using the roles will turn to the cards to find useful questions to ask. Occasionally, when we have stopped handing out the role cards, a group will ask for a set of cards when they are struggling to collaborate effectively. Even if students never reference the cards, simply having the clear message that every student can and every student should contribute to their group has a positive impact on the way students interact.

Strategy 3: Scientific abilities discussions

Students often enter our classes assuming that being good at physics means doing calculations quickly and accurately. One way to disrupt status is to explicitly discuss the skills and abilities groups needed to complete a task to promote a much broader view of being good at physics.[3] After completing a group-worthy task, we ask students to brainstorm as many different skills their group needed as possible. We then ask groups to share those skills in a whole-class discussion to compile a list, giving specific examples of how their group used each skill to ensure that students recognize these skills as meaningful contributions. After a high-quality task, students are able to generate extensive lists. This leads naturally into a discussion about the fact that no individual could possibly be an expert in all of the skills the group needed, so it would be difficult to complete the task without their peers. In addition, the lists are typically diverse enough that every student can recognize something they are skilled at, reinforcing that every student has something to offer. Frequently, the list of skills generated by students also has significant overlap with formal academic skills, such as the science and engineering practices in the *Next Generation Science Standards*.[15] By explicitly connecting the skills identified by students to these formal academic skills, we are able to validate their value in the classroom.

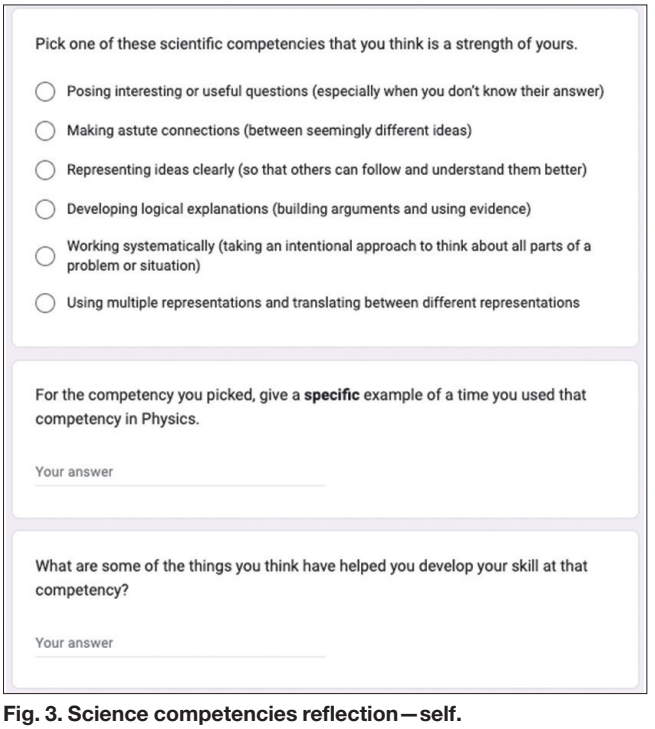

Fig. 3. Science competencies reflection—self.

Strategy 4: Frequent reflection

Reflections are another opportunity to disrupt status by expanding students' perceptions of what it means to be good at physics. We use a variety of surveys and reflection tools with different purposes. Some, such as the reflection in Fig. 3, which is adapted from a list of important competencies in math developed by Horn,[16] focus on the skills that students see themselves using. These reflections help students to recognize the range of ways that they are good at physics, in turn setting the expectation that they have something valuable to contribute to their groups, similar to the discussions from strategy 3.

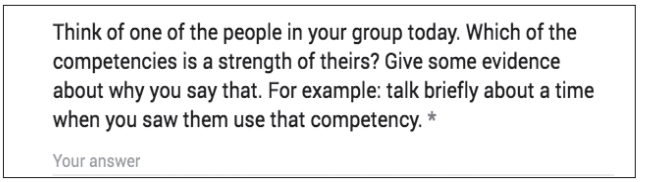

Fig. 4. Science competencies reflection—peers.

We also ask students to name a specific example of their peers demonstrating a skill, as in Fig. 4, or to recognize someone who is "under the radar or not a close friend" in their class. Asking students to recognize their peers results in them expecting that everyone they work with will have something to contribute to the group, which reduces the impact of status on their interactions. It also helps the students who receive this recognition to appreciate the ways they are contributing to groups, reinforcing that they have something to offer and should be an active participant.

Typically, we ask students to complete some kind of reflection at least once per week, so we have several different options we can rotate through. Along with helping shape how students think about group work and status, the reflections give us frequent feedback on how students are feeling about the class and group work in particular, equipping us to intervene and adjust before small problems become significant concerns.

Conclusion

These strategies have helped us give all students opportunities to meaningfully contribute and have their ideas valued by their classmates as we aim to make our classrooms more equitable. We have found that not only are nearly all students engaged during small group work and feel their peers respect their contributions, but they are more comfortable contributing to whole-class discussions because of the positive experiences they have had with their peers. It is important to note that none of these strategies are something that happens during a single lesson; promoting equitable group work is an ongoing task that requires conscious effort from the first day of school until the last. In addition, more than any particular strategy, what has been most valuable to us is continuously attending to what messages we are sending to students about status and what we value in our classrooms. Considering those messages impacts not only how we structure group work, but the majority of the instructional decisions we make.

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North St. Paul–Maplewood–Oakdale Public Schools, North St. Paul, MN; mrstoeckel@gmail.com