Strategies to explore multiple ideas and seed argumentation

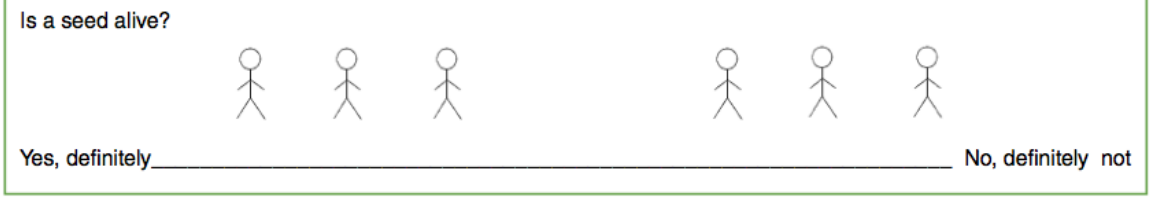
Idea line up *(activity description adapted from Gould, D. 2014.* Science Scope*. Let's Talk Science: Seeding Argumentation About Cells and Growth, pp. 65-75.)*

The *idea line up* is a structure that allows a teacher to use the diversity of perspectives in his/her classroom to generate heterogeneous groups of students for discussion. This diversity of thinking is a good place from which to develop a classroom community that supports argumentation. More student-initiated science talk happens when students are connected with peers who have opposing perspectives (Clark & Sampson, 2007). The *idea line up* is best used prior to an investigation/reading or soon before a whole class meaning-making discussion. If it is used prior to students gathering evidence, the question should be one about which students have enough prior knowledge/experience to have an opinion.

***How it works*:** The teacher provides a question that (s)he knows may have a continuum of responses, such as, "Is a seed alive?" Although this is a "yes or no" question, students are very likely to fall somewhere on a continuum of responses prior to collecting significant amounts of evidence or having the opportunity to synthesize the evidence they do collect with others. Some are likely to think that a seed is not alive because it doesn't move or breathe or really do much of anything unless it is planted. Others may think that it is alive because it can do things that living things do under the right conditions.

The question is displayed prominently for students to consider. Students are directed to position themselves on a line taped across the floor of the classroom to indicate their level of agreement in response to the question. Figure 1 shows an example of how the line might look. The teacher should give a minute or two for students to talk to the person next to them so they can clarify their own thinking on why they stood where they did.

FIGURE 1 **Sample classroom line used to probe student ideas about seeds**



Student positions on the line typically indicate a diversity of thinking. The teacher can then use their positions to form groups of students with differing ideas about the question. Other considerations can also be made for grouping and should be determined by the teacher based on student needs. In this example, students would have differing ideas about seeds and what it means to be alive. Students then discuss

their thinking and reasoning for their responses with the peers with whom they have been matched. Students should be prompted to listen carefully to each other's claims and evidence and respond with evidence to counter or support the claims of other students in their group. A group claims and evidence chart can be used to collect student thinking if your students are ready to complete such a chart independently. Student white board versions of the chart can be used as well so that students don't feel their ideas need to be final.

If the activity is used prior to an investigation, students can use the ideas from the initial discussion to continually weigh against the evidence they gather from their investigations. If the activity is used after an investigation but prior to a whole-group meaning-making discussion, ideas from the small group discussions can be used to prepare for a whole group discussion.

Four corners

Four corners is used for the same reasons as the *idea line up*. The only difference is that students are considering several claims (responses to a question). For example, a teacher might ask, "Where does most of the mass in a plant come from?" Claims for consideration might include, "soil," "air," "water," and "sunlight."

***How it works*:** The teacher displays the question prominently for all to consider. Each corner of the classroom is assigned one claim, also prominently displayed. Students are asked to go to the corner of the classroom that has the claim they agree with most. If they think more than one answer is correct, they should just pick one of the corners they agree with. If they don't agree with any claims, they should go to the middle of the room. Once in their corners, students should discuss with others why they chose that corner to help clarify their thinking.

Just as in the *idea line up* the teacher can use the student positions around the room to form groups with a diversity of ideas. The rest of the instructions are the same as for the *idea line up*.

Concept cartoons *(adapted from Cary Clark: http://www.southalabama.edu/coe/bset/dempsey/isd613/stuproj/summer00is/caryclark.pdf)*

Concept cartoons are cartoon-style drawings of familiar situations with an element of science (see Figure 2 for an example). Different cartoon characters put forth alternative viewpoints about the presented phenomenon. *Concept cartoons* allow students to consider a range of claims and respond to them using evidence.

***How to use them*:**
Put students into small groups (no more than four per group) and pass out one copy of the concept cartoon to each group, or one for every two students. If you are using the cartoons to access prior knowledge, ask students to consider which, if any, of the opinions they agree with on the cartoon. Ask them to share their reasons for agreeing or disagreeing with each idea. If you are using the concept cartoons to help students synthesize their understanding at the end of an investigation, you may wish to add additional prompts, such as:
1) What would you say to each of these kids? And what evidence do you have to back up your ideas?
2) Do you agree with any of the kids? If so, who? Why?
3) If you don't completely agree with anyone, what do *you* think? What is your evidence?

***Criteria for creating your own concept cartoons*:**
-They contain an everyday problem with a scientific dimension (focus on probable situations rather than theory)
-Minimal amounts of text
-Common alternative viewpoints (misconceptions) are put forth
-Alternatives appear of equal status (such as similar facial expressions and text size)
-Optional: blank text box with room for students to put in a new idea that is not currently represented.

Figure 2

Talk Triads

Talk triads provide students with practice: supporting their claims with evidence; being active listeners in a conversation; developing good questioning skills; summarizing a discussion; considering alternative claims; and considering the strength or quality of evidence. Due to the writing demands of the note taker role (see below), this activity may not be appropriate for younger students.

***How it works*:**

Put students in groups of 3. Have each student select a letter—A, B, or C. Have the A's start in the role of Talker; B's start in the role of Questioner; and C's start in the role of Note-taker. Share the roles with students.

- **Talker:** shares response to question and provides evidence to back up response
- **Questioner:** asks the talker questions to push on their thinking or offers alternative points of view to consider.
    - **What makes you think that? What's your evidence?**
    - **Can you say more about that?**
    - **Did you consider ___?**
- **Note-taker:** writes down main ideas of discussion and shares back what they found convincing or persuasive during the discussion.

Present the prompt for students to discuss. It may be a single claim or multiple claims to consider, a concept cartoon, an open-ended question, etc. Then give the talker and questioner about 3 minutes to talk. Give the note-taker 1 minute to share their thinking. Switch roles and repeat procedure two times. You may wish to change prompts each time or, depending on the complexity of the prompt, continue to discuss the original prompt.

Three Interviews

Three interviews provides students with the opportunity to consider a range of perspectives from different students and build on their initial understanding of an idea. In some cases, students will offer counterclaims or counterevidence to their interview partners, and in others they may just add to ideas offered by their partner. Students can think of these conversations with a partner as interviews because each person is asking his/her partner what (s)he thinks about a prompt.

How it works:

Introduce the directions for three interviews. Tell students that you will share a prompt in a minute. First, each student will have time to think on their own about their response to the prompt. You may have older students do a quick write.

Then students will stand up and find a partner. They'll discuss the prompt with their partner for 3-5 minutes (decide on the length of time needed based on what you think will work best for the prompt and your students). Each partner will take time

to share his/her own ideas regarding the prompt. Partners should ask each other questions that help uncover and build on each other's thinking. They will need to listen carefully to what their partner says and think about how it is the same or different from what they think.

After 3-5 minutes, tell students they need to switch partners. They will have 2-4 minutes (one minute less than the first interview) to talk to their new partner. During the second conversation, students should share what they discussed with their first partner (their own ideas and their first partner's ideas). Now students will have ideas from three new people, plus their own thinking.

After 2-4 minutes, have students switch partners again. This time they'll share from all of their previous conversations and continue to get new ideas from their new partner.

After 2-4 minutes, have students join in a whole class discussion and share what they learned from their three interviews. If students began the activity with a quick write, after the conclusion of the whole class discussion, have students return to their original quick writes and add a line of learning and their new thinking.

You may need to introduce particular sentence frames or other scaffolds to support partner discussions.

Quick version of directions:

Quick write
-1st interview 3-5 minutes
-2nd interview 2-4 minutes
-3rd interview 2-4 minutes
Whole-class discussion
Return to quick write

T-Charts

T-Charts provide students with an opportunity to track the evidence for and against different claims within the context of a whole class or small group discussion. This allows everyone equal access to the discussion and makes it easier for students to revisit points made earlier in the discussion. It also supports summarizing and concluding a discussion because all evidence and claims are easily accessible by all students, as is the quantity of evidence in support of or refuting a particular claim. Additionally, students might use *T-charts* to prepare for participation in a discussion.

How it works:

<u>For a whole class or small group discussion</u>

After multiple claims have been generated either by the students or by the teacher, create a t-chart for each claim. The claim should be written across the top of the poster. The t-chart then has "Evidence for" on one side and "Evidence against" on the other side. See example below. As students share evidence for and against each claim during a discussion, the teacher adds these ideas to the chart. Additionally, the teacher may wish to add a system to monitor the quality and strength of each piece of evidence offered, such as the use of stars to indicate high quality evidence and checkmarks to indicate strong evidence.

Claim: Crayfish prefer staying in dark places instead of light places.

Evidence for:	*Evidence against:*

In preparation for a discussion

Prior to having students enter a discussion, have students work alone or in pairs or small groups to generate their own list of evidence for and against particular claims. Students then bring their completed t-charts to a whole-group or small-group discussion to support their participation.