

Task-Tool-Talk: A Framework for Rigorous STEM Education

Task

- Definition: A meaningful, observable real-world anchor that creates a genuine need to explain, requires students to construct explanations or solutions through multiple possible lines of reasoning, and offers opportunities to act on that understanding.

A good task includes:

- a) A phenomenon (What is happening?)
- b) Sensemaking (Why is it happening?)
- c) Application (What students are doing and what is the mental load they are carrying?)
- d) Multiple perspectives (All students are able to enter the sensemaking space)
- e) Agency (What kinds of decisions, predictions, or design choices are students making?)

Traditional Task	Task in a TTT Framework
Students solve 20 proportional reasoning problems about recipes	Three groups propose different ways to scale a recipe for a large event. Students analyze the methods, determine whether each is valid, and argue which approach is the most efficient (phenomenon and multiple perspectives)
Students read about a severe storm before completing a worksheet on air masses	Students analyze weather data to decide whether public officials should cancel a community event or leave it as scheduled and they justify their recommendation using evidence from weather maps and forecasts (application and agency)
A lab where students test different materials for cleaning dirty water and then record results, but never explain why anything happens	A lab where students use their results to decide which material best cleans dirty water, and explain their choice using scientific evidence from the experiment (sensemaking)

Helpful Links:

[Wonder of Science](#) & [Performance Assessment Resource Bank](#)

Lesson Planning and Self-Reflection Questions:

- Does success in the task require students to construct a mathematical or scientific explanation, not just produce an answer or complete a procedure?
- Do students have to make a prediction, decision, or design/solution choice that is justified using scientific reasoning and evidence?
- Are multiple valid strategies or lines of reasoning possible, requiring students to compare, defend, or refine their thinking?
- Do all students have access to contribute ideas that are then tested, supported, or revised using shared mathematical or scientific criteria (not just opinion)?

Tool

→ Definition: Tools are resources that support language, help students make their thinking visible, and strengthen students' reasoning. Tools aren't for delivering ideas, they're for surfacing ideas.

Traditional Tools	Tools in a TTT Framework
A geometry formula sheet students copy without understanding	Geoboards students use to construct shapes, test ideas, and explain relationships among area, perimeter, and symmetry
A demonstration of magnetism that students observe	Magnets and various objects students test directly to sort materials and explain patterns of attraction and repulsion
A fancy slide deck with colorful and informative diagrams about how photosynthesis works	Students construct, share, and revise their own models to explain how redwood trees gain so much mass, using evidence from the phenomenon (even imperfect models become tools for discussion and refinement)
Students examine a completed graph or data set and identify trends the teacher points out	The teacher intentionally hides part of the graph or data set, and students predict what comes next, justify their predictions with evidence, then compare their thinking to the complete data and revise their explanations

Helpful Links:

- Data sets from [NYTimes Graphs](#) and [Information is Beautiful](#). Consider covering up part of a data set to have students talk about it!
- [Writing and discussion supports](#) from STEM Teaching Tools

Lesson Planning and Self-Reflection Questions:

- Are my resources making my (the teacher's) thinking visible, or do they make students' thinking visible?
- Do the tools make student thinking visible so it can be explained, discussed, and revised by others?
- Do the tools support students in using language to reason through ideas, not just complete a task faster?
- Are students actively using the tools to explore relationships, patterns, or cause-and-effect rather than passively observing or copying?

Talk

→ Definition: The things students say that drive learning forward.

Key Points:

- a) The goal is not a greater *quantity* of talk, it's about greater *quality* of talk
- b) Depends on the *task* and the *tools*
- c) All students' ideas are heard, but all ideas are also accountable to evidence and shared criteria.
- d) Culture shifts take time

Traditional Talk	Talk in a TTT Framework
The teacher asks a question, calls on one student, evaluates the answer, and moves on.	Students first think independently, discuss with a partner, then share and critique multiple ideas before the class reaches consensus.
The teacher immediately corrects an incorrect answer.	The teacher asks, "Who agrees? Who disagrees? What evidence supports your thinking?" before addressing the misconception.
Students ask the teacher whether their answer is correct.	Students explain their reasoning to classmates, ask questions of one another, and use evidence to determine whether an explanation is convincing.
The teacher does most of the talking during the lesson.	The teacher listens, probes, and presses for evidence to support students carrying the mental burden of learning.

Helpful Links:

- a) A [Primer on Productive Talk](#) - Start here if you like reading and theory!
- b) [Establishing Classroom Norms for Discussion](#)
- c) [Posters](#) you can hang around the room
- d) Video: [Encouraging Academic Conversations with Talk Moves](#)

Lesson Planning and Self-Check Questions:

- How does the culture of my classroom support or detract from students contributing to the shared learning?
- Are students given opportunities to work out their ideas verbally before committing to an answer?
- Are all students speaking out loud at least one time during the lesson or class period? If they aren't sharing in front of a whole group, are they at least sharing with a peer?
- Did I give the students something meaningful and sufficiently unclear to talk about? Do the students have to provide or choose between multiple perspectives, or make a decision together about what to do?

Please feel free to contact us! We want to hear from you!

Audrey Moorhouse
amoorhouse@communityofsaints.org

Natalie Hartung
nhartung@communityofsaints.org