

Question Formulation Technique

1. Brainstorm as many questions as you can about the phenomenon and record on a dry-erase board.
2. Sort your questions into three categories:
 1. Questions that can be experimentally investigated.
 2. Questions that need an experimental answer but that you can't do in the classroom (and so will have to look up)
 3. Mechanistic questions (why or how) that require using critical thinking, logic and interpretation of observations.
3. Choose three that need to be answered through experimentation. Try to write at least three specific questions that could be answered through investigation.
4. Engage in a class discussion of ONE question – discuss and refine as needed to provide a model for how to write a question.

Example from a 5th grade classroom:

Students added water drops to a penny and noticed that the drops formed a kind of bubble on top of the penny. They wondered whether that would be true on all surfaces. They were challenged to come up with an experimental driving question around which to design their investigation.

- Class: Will it work everywhere?
- Teacher: Will what work where?
- Class revise: Try it on other surfaces.
- Teacher: That's not a question.
- Class revise: Will it work on other surfaces?
- Teacher: Will what work?
- Class revise: Will the water work on other surfaces?
- Teacher: What does 'work' mean?
- Class revise: Will water pile up on other surfaces?
- Teacher: can we find a more precise term for 'pile up'?
- Class revise: form a dome or bubble shape
- Teacher: Can we make 'will it' be more precise or answerable?
- Class revise: To what extent will water form a dome shape on other surfaces.

Then they were ready to design an investigation

5. Peer review

As students become more proficient at crafting experimental questions, the whole class step can be replaced with a peer review, where students write their questions on a dry-erase board or other easy-to-share surface, and groups rotate through and leave structured feedback on paper or sticky tags or using different colored pens to questions prompted by the instructor, such as:

- Does the question clearly define what will be investigated?
- Do you understand what will be investigated?
- Do you see any problems around how this group might design an experiment?
- Do you have suggestions for how this question be more succinctly or clearly worded?

6. Students begin designing experiments, using tools provided by the instructor.