Formative evaluation can take creative forms, such as these confusion graphs, which have opened the door for participants to communicate their trials, tribulations, and reactions to the nature of research.

**How to Conduct These**

**Design**
- I currently use these during research meetings:
  - group 2–3 participants by either sub-discipline or research methods
  - find a scientist who is not currently a mentor; an interested outsider for that year
  - someone working in the same general research area (or familiar with the same methods)

**Conduct**
- as we are gathering to start the meeting give them the blank graph and a pen/pencil and ask them to draw their curve
- conduct the rest of the meeting
- ask them to explain their graphs toward the end, after rapport has been reached with the stranger

**When**
- we usually do these in about week 8, in place of a third practice talk
- the participants do not need to prepare

**Benefits**
- the research meetings allow me:
  - to see how well they can talk about their research and answer questions
  - how interested they seem to be in their work
  - glean how well they are getting along with their mentor(s)
  - it allows them:
    - opportunity to meet another scientist
    - tap into another school
    - hear about another scientist’s career journey
  - the confusion graphs open the door to what can be harder conversations about how their project has gone

Most graphs take a form like those above: a general falling trend with small confusion and clarity spikes. Most participants experience the roller coaster nature of research.

Occasionally graphs reflect big changes in the scope of the project. This can happen with a good student-mentor situation, where the student is excited about the project and wanting to continue the work. Sometimes, however, a spike results from a once-hidden, now-revealed lack of understanding that is then dealt with in the second half of the program.

The program has been run by five different scientists, faculty, or outreach staff, under several NSF grants. Dr. LaDue has been the Director and PI since 2001.