

Critical STEM Pedagogy

Our conversation led to thinking about the shape of a resource to guide the design of student experiences in STEM—specifically, data literacy & computational mathematics—to excavate ways in which learning experiences and their tools (e.g., data sets) can be designed/used in oppressive ways.



Tool 1: Definitions

Intended to promote reflection by "level-setting" with a common understanding of the terms relevant to this work.

[Tool 1 link](#)



Tool 2: Questions

Intended to provide some questions to help educators evaluate/assess their student experiences (existing or newly designed) with the lens of Critical STEM Pedagogy and make changes.

[Tool 2 link](#)

[Comprehensive resource/literature review](#)



Tool 3: Student Pause

Intended to provide a guide to have students critically examine resources in a lesson. Currently oriented around data sets, but could be applied more broadly.

[Tool 3 link](#)

Questions

Intended to provide some questions to help educators evaluate/assess their students' experiences (existing or newly designed) with the lens of Critical STEM Pedagogy and make changes.

Two core rules:

- Changes must increase resonance with and excitement of students
- What students learn empowers them and increases their agency

Before planning STEM teaching, read this list of questions until you **find one or several that inspire you to infuse data driven social justice into your STEM teaching.** 'We' is often used in these questions because they are inclusive of students and teachers, and often the broader community.

- How can we make connections between this topic and our student's lived experiences, families, and communities? (If not possible, is this topic really worth spending time on?)
- Begin with the end in mind: know your purpose.
 - What will/do students get from this activity?

- Is it statistical analysis for curiosity/science [photosynthesis and sea slugs], or is there something that will lead to the desire to improve the world [pollution and communities of color]?
 - **Only the 2nd kind is critical statistical literacy**, and possibly better for the world and more motivational
- Did I interrogate this data set from an inclusive standpoint?
 - How can I remain compassionate throughout and during this process?
 - How do I monitor when/if/whether I am projecting judgment onto the subject/artifact?
- Is there a social justice lens that we can use to learn about this topic?
- How can we use this knowledge to expose inequities?
- How can we use this knowledge to address inequities?
- Has (can) this knowledge be used to empower/disempower groups of people?
- Have you had your students consider how power relationships might have been influenced by:
 - Perversion of data
 - Erasure of data
 - Bias in data
- What kind of data can we use to better understand the social justice aspects of this topic?
- Who collected this data and for what purpose?
- *Whose values may be implicitly represented or excluded in the data?*
- Does the source have an agenda?
- Is the source ignoring, overlooking or leaving out information?
- Is this source using unnecessary language to change an audience's mind?
- Who does the data empower or disempower?
- How might you change the way the data was collected to ensure equity?
- What are valid interpretations of this data?
- How might the data be interpreted incorrectly?
- Is the data or the way it is displayed biased?
- *Who appears to benefit and who appears to suffer as a result of the way the data was analyzed, presented, and published?*
- *Does exploration of this data offer ways to help understand or improve social conditions in our present world?*
- Does the data represent some groups and exclude others? (for example, many psychological studies are done with college students and don't represent the full population either racially or economically)
- Is it possible that student-collected data is more useful/motivating/interesting than curated large data sets? (geospatial projects are very good for this)
- What do you already know?
- How do you know that?
- What seems to be the reason for this happening?
- What are you trying to prove, disprove, demonstrate, critique, support?
- What are you overlooking?

Our Community is in search of a better structure in which to present these Questions.

Ideas:

Use the “[Geography for Life](#)” standards as a model.

Inspiration [from work on](#) the responsible and ethical use of spatial data

Find core themes, principles, and/or self-reflection-and--interrogation methods to group our questions for the STEM teacher. Such groupings could include

- Interrogate the Data

- Variety of Content-based Lenses

 - (scientific, statistical, engineering, technological, mathematical,)

- Connection to Self

- other?

[Design process for facilitators/ teacher leaders would be footnotes, starting with 4 steps in the design process by EquityXDesign, for example.]