ONLINE TEACHING & LEARNING IN STEM

A Virtual Workshop at Davidson University

Clarissa Sorensen-Unruh

https://bit.ly/STEMcomm1

A LITTLE ABOUT ME

- I'm (essentially) tenured faculty at my institution, and I teach both chemistry and statistics.
- I have two M.S. degrees (Organic Chemistry (2000) and Statistics (2020)) and am working on my Ph.D. in Learning Sciences at the University of New Mexico
- My undergraduate education was at an institution very similar to Davidson University – Trinity University in San Antonio, TX
- I'm teaching the Digital Pedagogy Lab track "STEM-H and Critical Digital Pedagogy" at the end of July, 2020.

https://bit.ly/STEMcomm1

The New Mexico Sunset (as seen from the Sandias)

WHERE TO FIND ME

- My Website: https://clarissasorensenunruh.com/
- My blog on ChemEdX: https://www.chemedx.org/blogs/clarissa-sorensen-unruh
- Twitter handle: @RissaChem
- LinkedIn, Instagram, YouTube all public

https://bit.ly/STEMcomm1

WHAT I BRING TO THE TABLE

- Practice
  - Teaching Full-Time at CNM (15 classes a year (5 classes a semester; 3 semesters a year)): Chemistry since 2002 (18 years) and Statistics since Fall, 2019 (1 year)
  - Taught Part-Time at UNM between January 2012 and May 2014 (1 400-person class each Fall and Spring)

  [In case you're counting, that's over 270 classes I've taught in my career so far.]
  - Teaching *Online* since 2005 (I was the first in Chemistry to embrace teaching online 15 years ago)
  - YouTube channel: https://www.youtube.com/user/csoren1
- Reflective Practice and Communication

https://bit.ly/STEMcomm1

Social media and ethics in the classroom: Reflection and Analysis

Clarissa Sorensen-Unruh
Central New Mexico Community College

What questions must we ask before ethically using Social Media in the classroom?

What are the ethical implications of requiring students, particularly those at greatest risk, to join a public Social Media platform (like Facebook, Twitter, SnapChat, Instagram, etc.)?

How do we protect students on virtual public discussion forums from trolls, bullies, hackers, criminals, or themselves? Is it our job to do so?

What does consent entail in the context of using required classroom social media? How do we ethically obtain consent from students?

How do we create virtual communities among our students in ways that transform learning?

What do we gain (and lose) by using Social Media in the classroom?

We may gain transparency.

We may gain more connection and community.

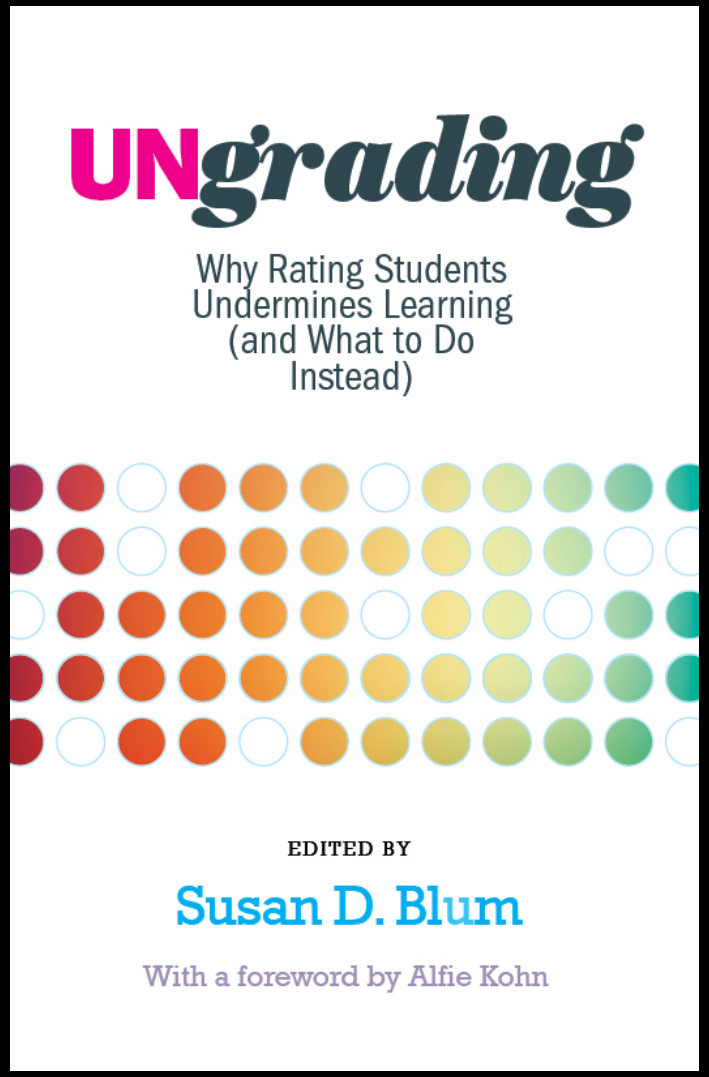
We may gain the ability to know our students better and provide more regular feedback.

We may gain an ability to clarify, correct, repeat, and interact outside of class time.

We may gain an ability for us and our students to network with other chemists across distances and time.

We (our students + ourselves) may lose autonomy, privacy, and/or anonymity.

WHAT I BRING TO THE TABLE



- Research
  - I'm interested in interventions of Critical Digital Pedagogy in the STEM classroom, including alternative means of assessment and evaluation.
  - I'm a mixed methods educational researcher, focusing on multivariate (often Baysean) statistics (quant) and grounded theory and narrative (qual) methods.
- Reflective Practice and Communication

https://bit.ly/STEMcomm1

A QUICK DISCUSSION ON THE @HYPOTHES.IS ARTICLE – REFLECTION

- What struck you from the article?
- Did you have any A-ha's that you'd like to share?

https://bit.ly/STEMcomm1

A QUICK DISCUSSION ON THE @HYPOTHES.IS ARTICLE – SYNTHESIS

- What themes emerged from the article?
  - If we were coding this article, what are the top three themes you would use to describe the article?

https://bit.ly/STEMcomm1

A QUICK DISCUSSION ON THE @HYPOTHES.IS ARTICLE - APPLICATION

- Consider the final questions for this article (below). How do we apply these to our teaching practice?

  "(1) For whom might the educational experiences we envision and enact be humanizing? Who might our practices inadvertently exclude? And how can we, as participants in the teaching-learning process, better address these differences?

  (2) From whose perspective are particular practices considered "humanizing"? In what ways might these approaches lead to experiences of dehumanization, despite good intentions?

  (3) In what ways do the conditions we subject our teachers to promote the ideals of humanizaçao? In what ways might we, as institutions, foster conditions that promote humanizing experiences for both teachers and students?" (Mehta & Aguilera, 2020)

https://bit.ly/STEMcomm1

Online Evaluation
(Feedback, grading and ungrading)

Online Labs

Open Pedagogies & Open Science

Integrating Social Justice into STEM

Critical Digital Pedagogy in STEM

Trauma-Informed Pedagogies of Care

Online Authentic Assessment
(PBL, Project Based Learning, Blogs, Reflection)

Building Community Online

https://bit.ly/STEMcomm1

CRITICAL HUMANIZING PEDAGOGY

- Humanizing our pedagogy means deeply listening to what's important to our students/participants and incorporating their thoughts, suggestions, etc. into our class/workshop/etc.

'We need teach through the screen, not to the screen.'

Sean Michael Morris, *Technology is Not Pedagogy*

"This learning journey is really the student's learning journey. We're kinda the Sherpas on this journey…our job is to basically be in the background."

- Me, *Online Learning in a Hurry Guest Episode 3*

https://bit.ly/STEMcomm1

HOW DO WE INCORPORATE CRITICAL HUMANIZING PEDAGOGY INTO OUR CLASSROOM?

Some Practical Suggestions

WHY WOULD STUDENTS CHOOSE TO TAKE ONLINE COURSES AT DAVIDSON (AND NOT THEIR LOCAL CC)?

- Elite colleges are worth the money because of the peer-to-peer interaction and the alumni connections
- The networks and connections built during college are critical for future employment, friendships, etc.
- Special relationships are forged in hardship - the students (particularly freshman) really need opportunities to build relationships during this time.

https://bit.ly/STEMcomm1

WHERE I LEARNED THE ESSENTIAL SKILLS AT TRINITY

- Critical thinking?
- Team-building?
- Written and oral communication?
- Leadership?
- Positive specific feedback and mentoring?
- Etc.?

From my Trinity U. peers, not my Professors

Where? Hallway conversations, study groups, in-class discussions, the in-betweens and waiting times

https://bit.ly/STEMcomm1

BUILDING COMMUNITY ONLINE

"Creating a sense of community in an online course involves both

effort and intention, but it should form an essential part of your

thinking." (Darby, p. 77)

https://bit.ly/STEMcomm1

BUILDING COMMUNITY ONLINE

"By using multiple modalities and vehicles to build relationships among participants, by expanding upon and beyond alphabetic textual relations, we found that trust can be developed more quickly in some situations because multimodal communications let us see multiple facets of one another quickly and readily. And when we converse and share in semi-protected spaces, like moderated Twitter chats or forums, we get to see how others interact and thus help define what it means to be community members there and then."

(Zobel, Lenaghan, Honeychurch, DeRosa, Cedillo, & Bali, 2015)

https://bit.ly/STEMcomm1

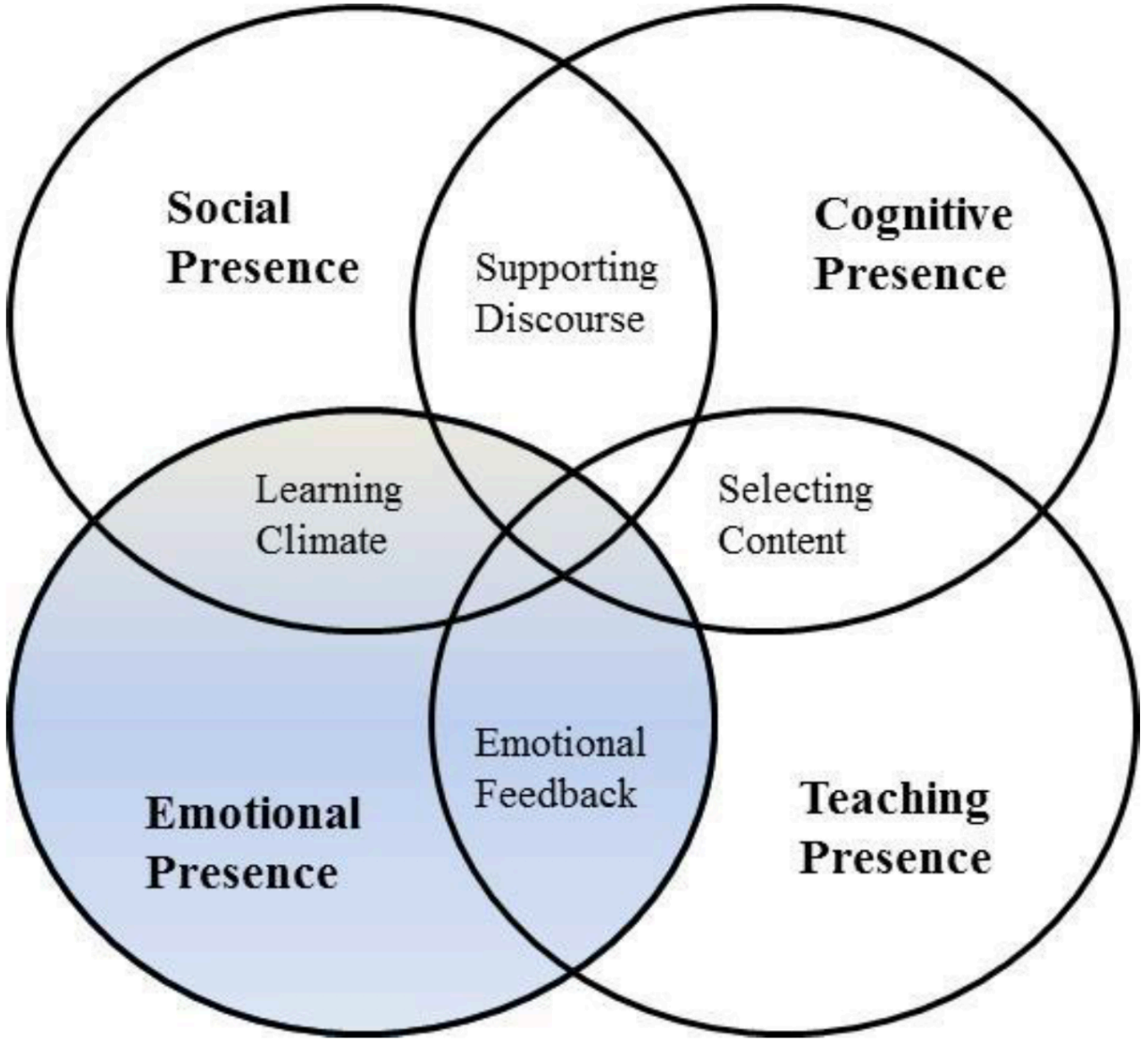


Figure 1: Community of Inquiry Framework for Online Learning (adapted from Stenbom et al. (2014)

Image from Rientes, B. R., & Rivers, B. A. (2014). *Measuring and understanding learner emotions: Evidence and prospects* (Review 1, pp. 1-16, Rep.). Learning Analytics Community Exchange.

BUILDING COMMUNITY ONLINE

- Using Slack or Discourse Channels
- Using Blogs
- Using Social Networking Platforms
- Encouraging and providing opportunities for social (see 5C Framework on the next slide) & cooperative learning
- Using synchronous online learning [OPTIONAL]: Zoom (including breakout rooms), Unhangouts (max. 10 people; https://unhangout.media.mit.edu/), FaceTime
- Using Inclusive Practices or Liberating Structures
- Using Self or Peer Feedback (RISE model)

https://bit.ly/STEMcomm1

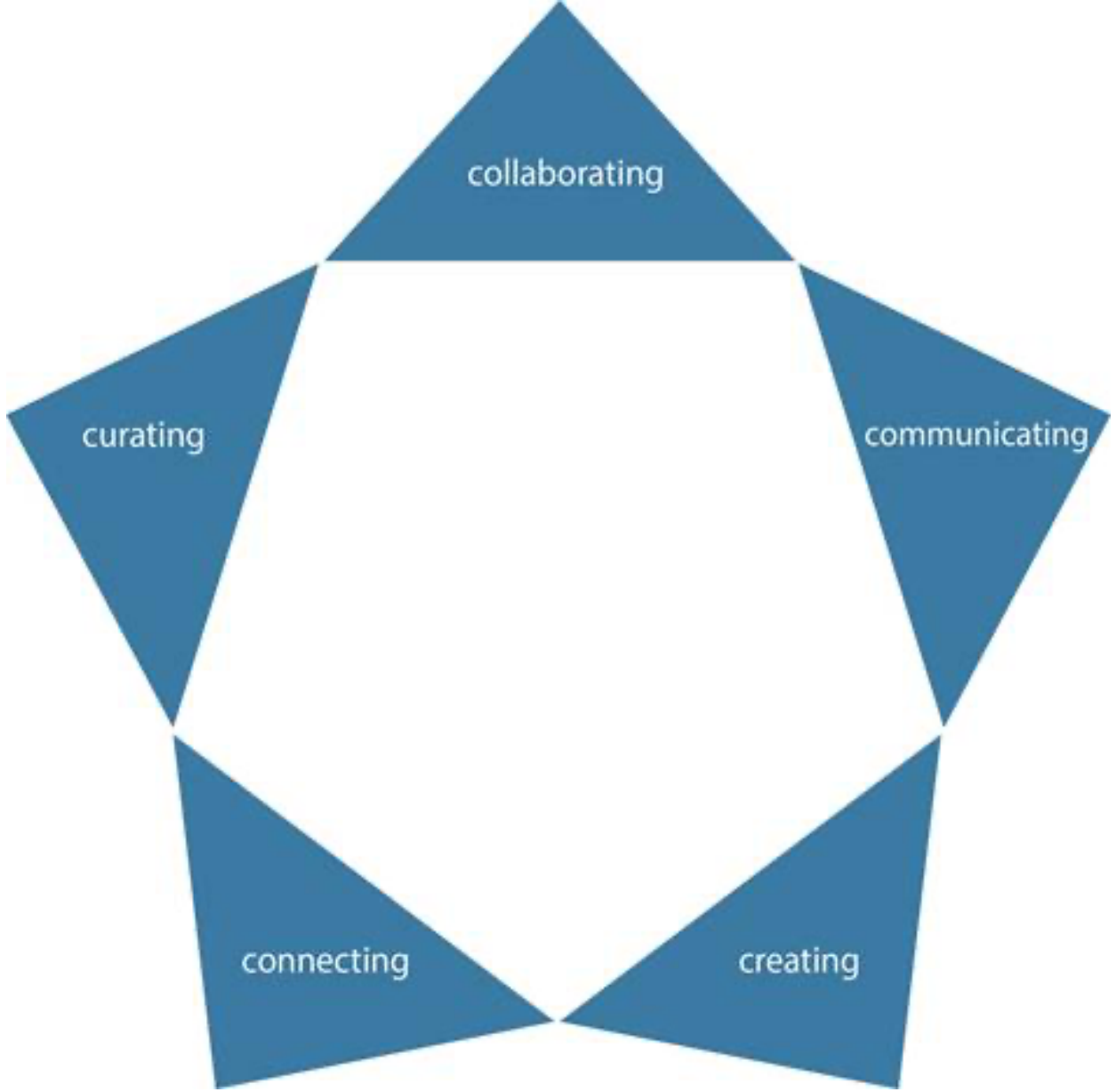


Image from Nerantzi, C. and Beckingham, S. (2015) BYOD4L: Learning to use own smart devices for learning and teaching through the 5C framework, in Middleton, A. (ed.) (2015): Smart learning: teaching and learning with smartphones and tablets in post-compulsory education, Sheffield: MELSIG publication. Found on https://project-based-learning-toolkit.com/the-5c-framework/

SOME COOPERATIVE LEARNING SUGGESTIONS

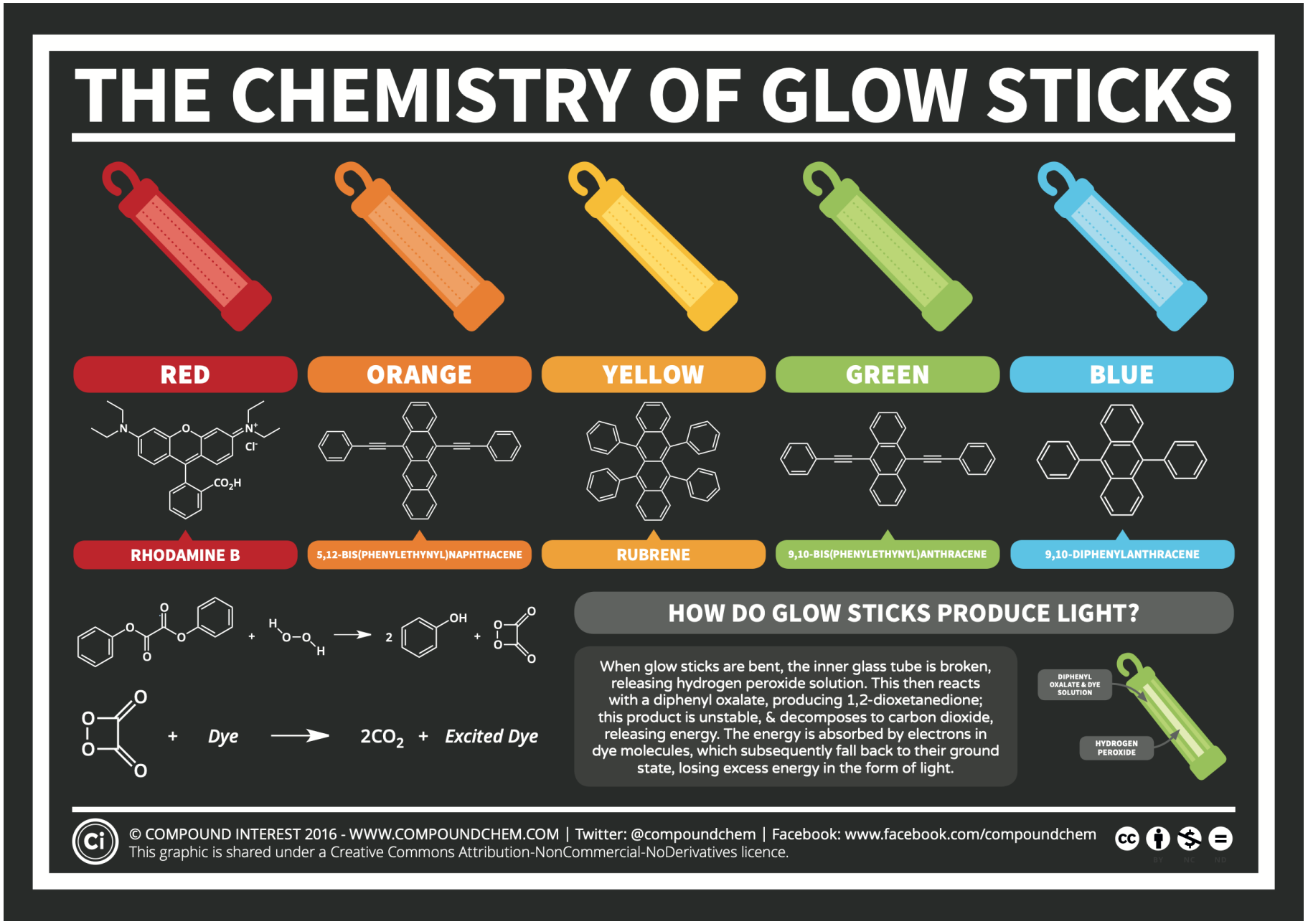
- Introductions are key (sometimes online team building exercises are also needed)
- Creating spaces that they can work together in
- Using Whiteboards (in synchronous Zoom sessions, MS Whiteboard, Bai Boards, etc.)
- Using clickers-type questions (Mentimeter, Poll Everywhere, Kahoot*)
- Allowing students to work in groups or forcing them to work in groups
- Synchronous discussions
- Wrong Theory or TRIZ

I like Kahoot WAY less than the others. Here's a video discussing Kahoot vs. Mentimeter: https://www.uwindsor.ca/education/openpage/kahoot-mentimeter

LEVERAGING YOUR NETWORK TO BENEFIT YOUR STUDENTS

- Student work must be public and consented
- Students or you pick a Hashtag and place it in the title of every blog
- A simple google search will reveal the list of blogs
- Telling your network to look at the blogs can result in some revealing surprises
  - FDA connection resulting in an internship
  - EPA connection resulting in online friends
  - NASA connection

https://bit.ly/STEMcomm1



Why do we not have the same fun experimental attitude in teaching as we have in our research labs?

https://bit.ly/STEMcomm1

INCREASING STUDENT AGENCY

"…one of the main reasons I try to center student agency is the selfish reason that it helps me teach better and the larger goal of nurturing independent learners. I always say learning is always student centered, it's teaching that often isn't."

Maha Bali, Comment on Karen Cangialosi's blog "Thoughts on Student Agency" https://karencang.net/teaching/thoughts-on-student-agency/

https://bit.ly/STEMcomm

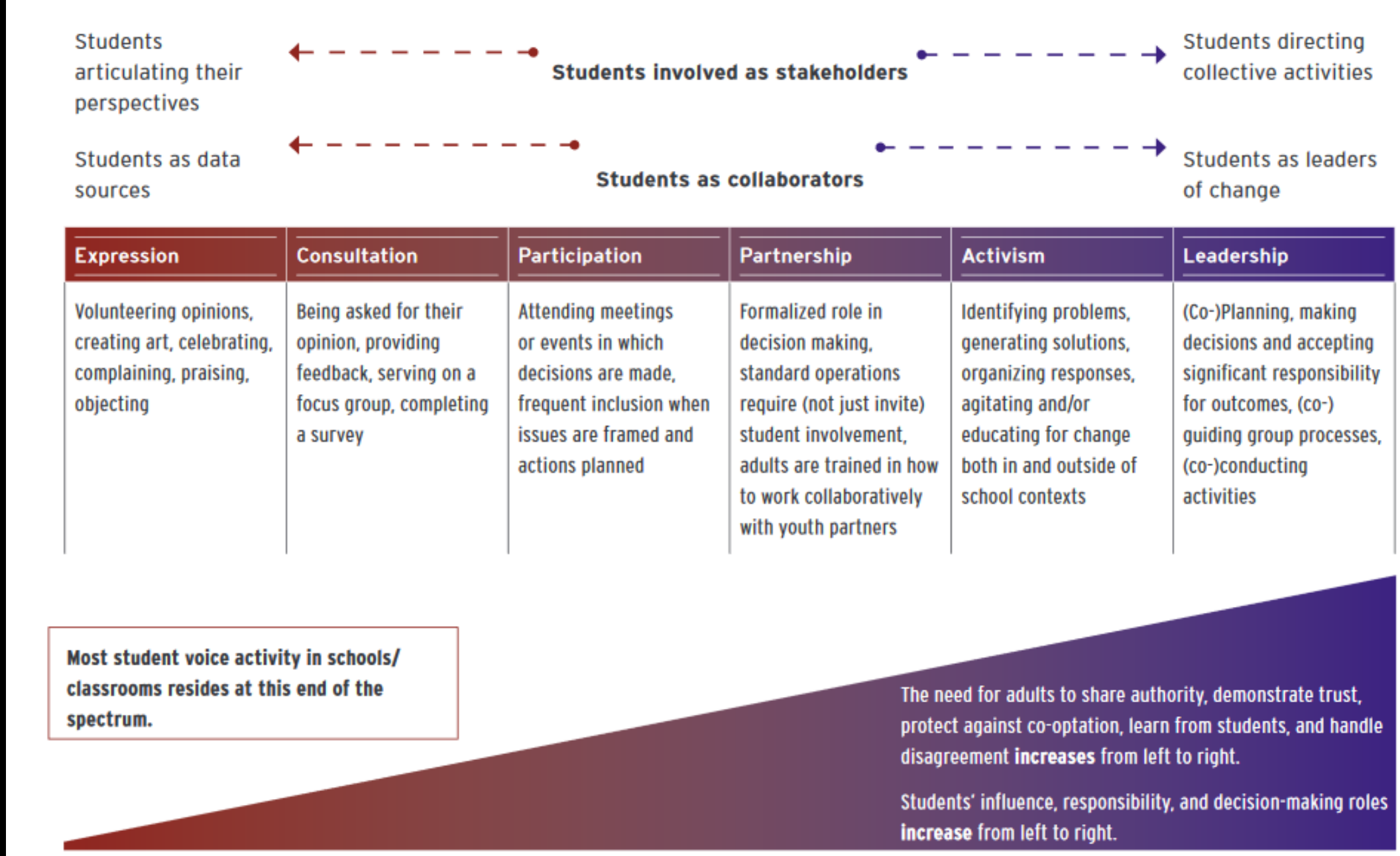


Image from https://aurora-institute.org/cw_post/student-designed-performance-assessments-for-personalized-learning-and-student-agency/?fbclid=IwAR1d9xiOHr1hxif_0cLVxWkgqvS_7zM_ZX4PsgecpkmifiGk2ZStSciEXFE

INCREASING STUDENT AGENCY

- Use surveys or Google Forms to ask students about how the content is covered and how we might assess their work
  - Since we (in STEM) require specific and abundant content to be covered, we can't always ask what the students would like to learn, but we could ask them about the components of the class that they might be able to exert some control over…
- Alternative kinds of assessments (problem or project-based) based on student interest
- Alternative kinds of evaluation (peer or ungrading) that help students build self-assessment skills and give them a say in the way their learning is evaluated

https://bit.ly/STEMcomm1

GOOGLE FORMS I USED FOR SUMMER 2020 ASYNCHRONOUS ONLINE GENERAL CHEMISTRY II

- Student Individual Assessment https://forms.gle/JsmXdrSNYzVsuGBT9
- Class Assessment Strategy https://forms.gle/GydQHsCtGe32rJ4bA
- Class Content Coverage Strategy https://forms.gle/6QTzSWhmpn18h2fS6

https://bit.ly/STEMcomm1

If we don't listen and respond to our students' feedback, giving it may start to feel a little like this…

INCREASING STUDENT AGENCY – USING OPEN PEDAGOGY

"So one key component of Open Pedagogy might be that it sees access, broadly writ, as fundamental to learning and to teaching, and agency as an important way of broadening that access…we might think about Open Pedagogy as an access-oriented commitment to learner-driven education AND as a process of designing architectures and using tools for learning that enable students to shape the public knowledge commons of which they are a part."

(DeRosa & Jhangiani, 2017, paragraphs 13 and 14)

https://bit.ly/STEMcomm1

INCREASING STUDENT AGENCY – USING OPEN PEDAGOGY

- We can accomplish increased student agency within the open pedagogical approach by:
  - Using reflective blogs
  - Encouraging students to build out their own portfolio while doing projects or papers in your class
  - Build a textbook, social media channel, etc.
  - "Try, explore, fail, share, revise." (DeRosa & Jhangiani, 2017, paragraph 25)

https://bit.ly/STEMcomm1

UNGRADING

- Changing the way we evaluate
  - How to Ungrade and Ungrading FAQ
  - Ungrading Webinar and Chapbook
  - Ungrading in Chemistry
  - A Practical Guide
  - Ungrading Bibliography

https://bit.ly/STEMcomm1

INTEGRATING SOCIAL JUSTICE INTO STEM

"As instructors, we have the power in our classrooms to choose to attend explicitly to issues of access, inclusiveness, fairness, and equity."

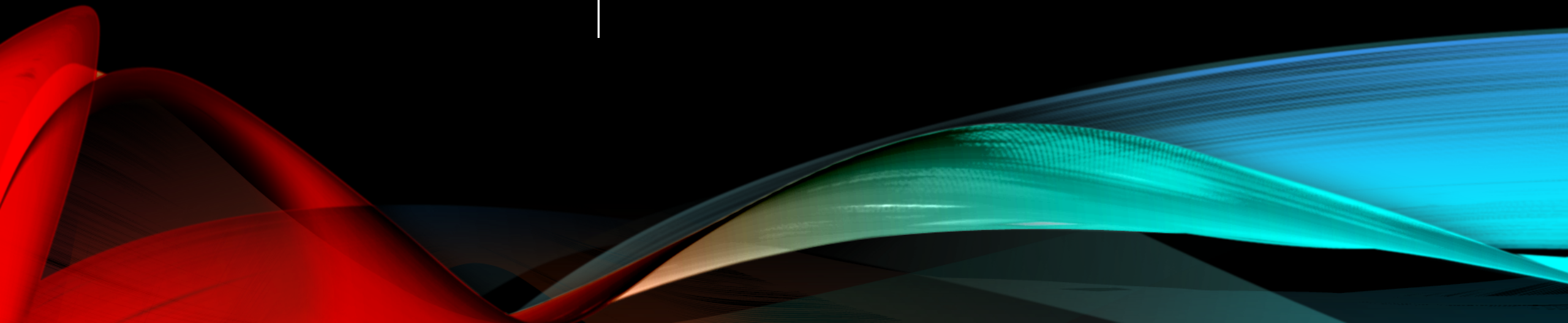
(Tanner, 2013)

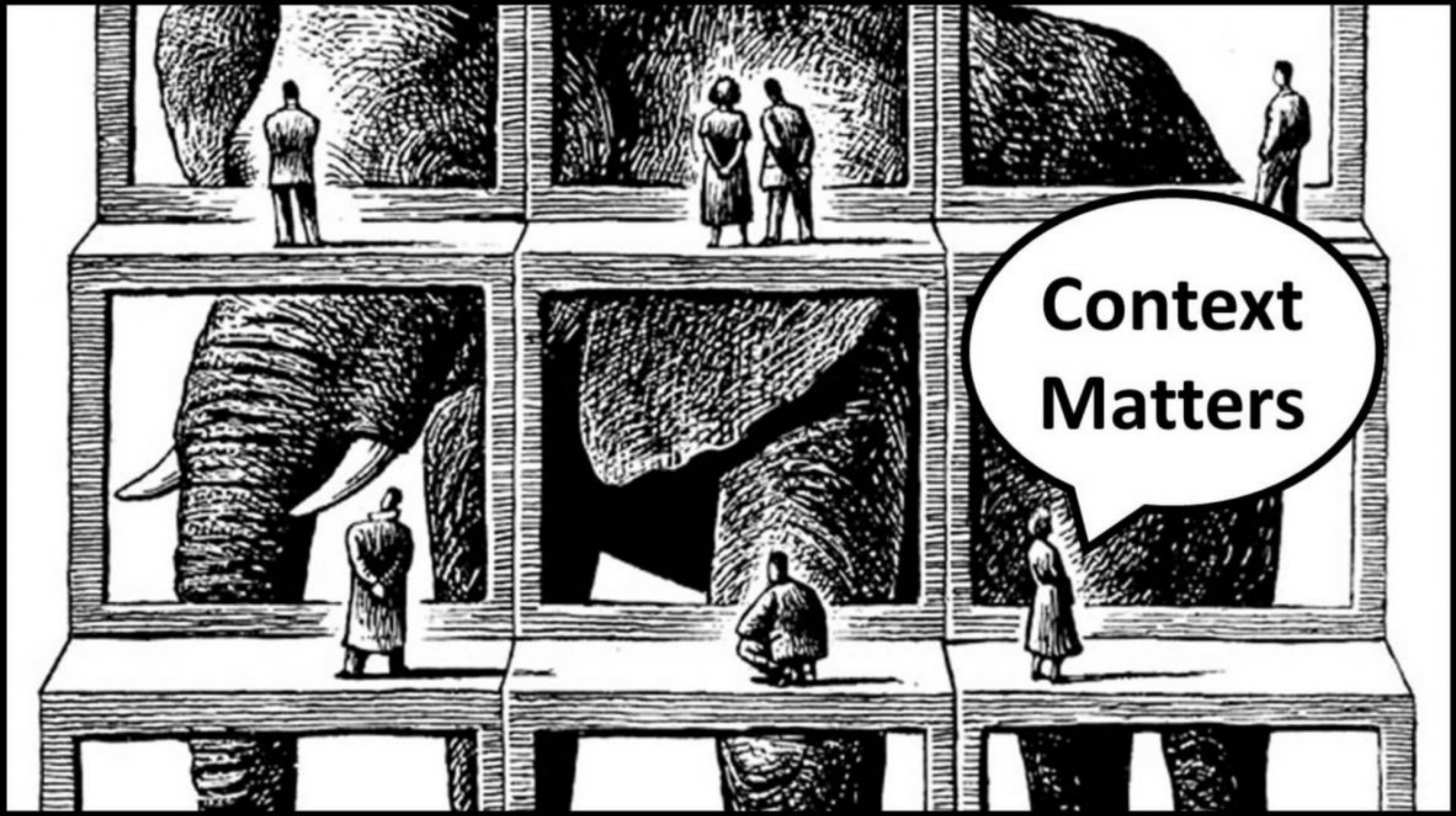
- Changing the way we teach
  - Resources for Inclusive Pedagogy 2.0 (compiled by Kevin Gannon)
  - Progressive Stack
  - Social Justice and the Curriculum (DPL 2019)
  - Decolonizing Science Reading List (compiled by Chanda Prescod-Weinstein)
  - Inclusive Citation, Inclusive Academia? Equity Unbound (led by Mia Zamora and Maha Bali)
- Willingness to change midstream

https://bit.ly/STEMcomm1

WHAT COMPONENTS OF YOUR TEACHING PRACTICE ARE ESSENTIAL?

WHERE DOES YOUR TEACHING PRACTICE BREAK?




Context
Matters

HELPFUL SCIENCE GOOGLE SHEETS & RESOURCES

- Online Lab/Simulation Resources (compiled by Dave Cormier)
- National Science Digital Library
- Decolonizing Science Reading List (compiled by Chanda Prescod-Weinstein)
- https://www.shutdownstem.com/
- Science in the Classroom (AAAS)
- PhET Simulations or CK-12 Simulations
- CODATA: Committee on Data (International Science Council)
- National Center for Case Study Teaching in Science
- NASA Science Live
- Center for Open Science
- Citizen Science

HELPFUL GENERAL GOOGLE SHEETS AND RESOURCES

- Inclusive Citation, Inclusive Academia? A webinar (and spreadsheet) via Equity Unbound (led by Mia Zamora and Maha Bali)
- Resources for Inclusive Pedagogy 2.0 (compiled by Kevin Gannon)
- The Open Faculty Patchbook (edited by Terry Greene)
- ACE Framework by The Open Learning & Teaching Collaborative
- Equity Toolkit for Inclusive Teaching and Learning – Colorado Rises
- Pivot to Digital: A TRU Community Resource
- Hybrid Pedagogy

REFERENCES

- Darby, F. & Lang, J. (2019). *Small Teaching Online: Applying Learning Science in Online Classes.* Jossey-Bass. https://flowerdarby.com/
- DeRosa, R. & Jhangiani, R. (2017). Open Pedagogy. In *A Guide to Making Open Textbooks with Students.* Rebus Community. https://press.rebus.community/makingopentextbookswithstudents/chapter/open-pedagogy/
- Mehta, R., & Aguilera, E. (2020). A critical approach to humanizing pedagogies in online teaching and learning. *The International Journal of Information and Learning Technology*, *37*(3), 109–120. https://doi.org/10.1108/IJILT-10-2019-0099
- Sorensen-Unruh, C. (2020). A STEM Ungrading Case Study: A Reflection on First-time Implementation in Organic Chemistry II. In S. Blum (Ed.) *Ungrading: Why Rating Students Undermines Learning* (pp. 139-155). Morgantown, WV: West Virginia University Press. https://wvupressonline.com/node/844
- Tanner K. D. (2013). Structure matters: twenty-one teaching strategies to promote student engagement and cultivate classroom equity. *CBE life sciences education*, *12*(3), 322–331. doi:10.1187/cbe.13-06-0115 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3762997/
- Zobel, G., Lenaghan, E., Honeychurch, S., DeRosa, R., Cedillo, C., & Bali, M. (2015, June 30). How we built an online community in just five days [Online article]. Retrieved from http://mahabali.me/edcontexts/moocs/how-we-built-an-online-community-in-just-five-days/