Pandemic Pedagogy: Taking Data-Viz Learning Online

Rahul Bhargava

1 Introduction

Data visualization has become firmly established as a critical and increasingly mainstream communication technique for our data-centered times. It is being taught in multiple fields - from journalism [4], to undergraduate computer science education [7], to business schools [8] and more. In both 2016 and 2017 this conference hosted workshops on the "Pedagogy of Data Visualization".

In the midst of a global pandemic, how do we continue to deliver creative and high-quality learning experiences for data visualization online? This short paper introduces two case studies of how I have taken hands-on activities related to data visualization and brought them online. They demonstrate to me that when considering moving an activity online one should ask themselves questions such as:

1. Can the activity be moved online without sacrificing learning goals and pedagogy?
2. What parts of the activity might your technology support? What parts might it hinder?
3. How can you turn the students' physical space limitations into an opportunity?

I don't consider these to be radically new questions in the world of online teaching. I reiterate them here, in the time of a global pandemic, to reinforce that simply moving activities online as-is is unlikely to produce strong learning outcomes.

2 Motivation

My approach to data visualization education is firmly rooted in principles of hands-on learning and constructionism [3]. I anchor my pedagogy in this central idea of Seymour Papert's – that learning occurs best when people are designing and discussing objects for audiences that are meaningful to themselves or their peers [6]. As businesses and campuses emptied and teaching moved online, I quickly began to reflect on what it meant to create constructionist experiences for data visualization learning in virtual settings.

Our Data Culture Project already offers a set of participatory, hands-on activities for learning various stages of the data visualization process. The dozen activities documented there function as a self-service curriculum online, used by tens of thousands across the globe to support learning in educational, non-profit, and business settings.

During the spring 2020 disruption I adapted and used two of the Data Culture Project activities in virtual classroom settings, as documented in the following sections. Each example pulls from my experiences this past spring taking my small undergraduate/graduate university "Data Storytelling Studio" course online due to the pandemic. The class included 18 students, meeting co-temporally in a Zoom room twice a week for roughly a third of the spring semester. Students came from various disciplines - business, education, public health, urban planning, engineering, computer science.

3 Case Study 1: Building Data Sculptures

The "Build a Data Sculpture" activity invites participants to build a physical representation of a data story using familiar craft materials within 10 minutes. In prior work I argue that this activity is particularly well-suited to environments that benefit from a low-tech and playful introduction to working with data [1]. As part of a semester long course, I've previously expanded this to be a 2-week group project.

Rescheduling caused by the pandemic made that impossible. I ran through a few options for taking this online which considering the three guiding questions I opened with:

(a) Eliminate it from my syllabus

(b) Have students remotely collaborate while one builds

(c) Have students build with their own materials at home

(d) Mail students a standard box of materials to build with

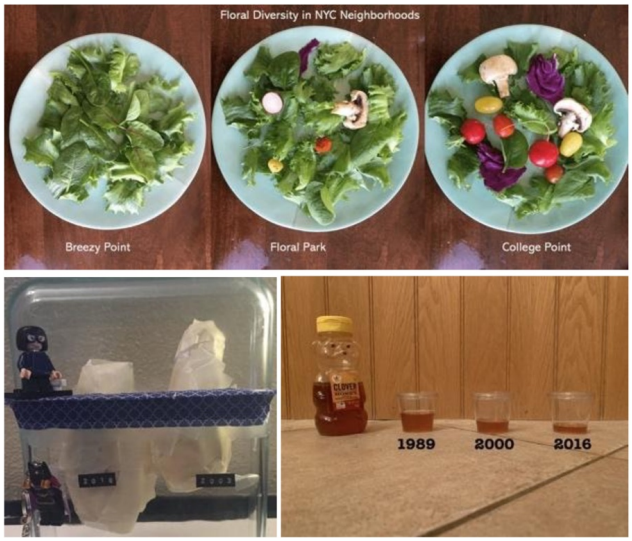

Fig. 1. Data sculptures created by students.

After weighing the various affordances, I decided to have them build small data sculptures individually with whatever they found around them (c). This maintained my learning goals and pedagogy, because it still offered them a chance to play with physical information encodings. I asked them to post photos of their projects to the class blog, in order to allow the creation process to avoid any technological intermediation but also support sharing and discussion. To connect the assignment to their interests, I asked them to work with a data story they had already created in one of the two previous group projects they had worked on. I felt this would focus the activity on the material affordances and evocative power of the physical objects they use, rather than on the story-finding process. This approach also turned their physical constraints into a positive, because they each would have different materials around them and would likely produce a diversity of approaches and projects.

The students built data sculptures that showed far more creativity than when I run the activity in the standard way (see Fig. 1). One used the amount of salad toppings to indicate floral diversity in different parts of New York City. Another smudged a globe with dirty fingerprints to encode air pollution. A third built a model of a two-storey museum exhibit that portrayed accepted vs. denied US FOIA requests with a

• *Rahul Bhargava is with the Northeastern School of Journalism. E-mail: r.bhargava@northeastern.edu.*

”tip of the iceberg” metaphor. As a whole, the sculptures captured each of Moere and Patel’s ”symbolic, iconic and indexical” taxonomy [5]. These results lead me to believe that this approach to taking the data sculptures activity online met my criteria for success quite well; my plan responded well enough to my three guiding questions to produce evocative projects that provoked discussion.

4 Case Study 2: Sketching a Visual Word Web

The ”word webs” activity is used by artists to help move a group from an abstract concept to a larger set of words that describe it. In the data visualization process this can help transition from abstract concepts such as “power”, “justice”, or “community“ to more easily depicted terms such as ”hammer”, ”scale”, or ”holding hands”. As part of my Data Murals process I adapt this technique to create collaborative pictographic word webs, helping brainstorm a symbol language for a data story [2].

Fig. 2. A pictographic word web created in person to tease out a symbolic language for “social exclusion” (in Brazilian Portuguese).

The activity begins with a large piece of paper with the central word of the story written on it. Each learner brainstorms connected words, in silence, and writes them on the paper, connecting each new word to the word that inspired it with a line. After about 5 minutes we hand out post-it notes and ask the participants to look for ideas that are easy to illustrate, draw each one on an individual sticky note, and stick it near the word that it illustrates (see an example in Fig. 2).

Rethinking this activity for a virtual setting, I found some tradeoffs needed to be made. I could support the participatory nature of it by using the virtual whiteboard feature built into our Zoom meeting. I found most students familiar with the technology from other classes they were in that had already used it. It allowed for collaborative writing to happen with real-time synchronization, so everyone could see what the other students were writing. Unfortunately the joy of moving around a large paper, leaning in and stepping back, didn’t feel like it would translate well to this technology. The serendipity of moving around the table lends a lot to this activity, so I was unsure of success.

I found that the first phase of word generation worked well, but the sketching process fell flat. The group of students created a word web that I qualitatively assessed to be similar in variety of scope to those made in physical settings (see Fig. 3). However, when we tried to shift into the sketching portion of the activity it fell apart. Students found it hard to sketch with the virtual tools provided, expressing frustration with pixelated drawings “not coming out the way I wanted”, wondering “where should I draw?”, and laughing at what they had drawn. As those frustrations mounted I decided to end the activity early.

In reflection, I attribute this to the affordances of the particular technology I chose - it both supported and hindered the activity. It didn’t allow for detailed sketching. That isn’t a criticism of the tool so much as a recognition of its intent. Sketching in a virtual environment, even with the goal of stick-figure like cartoon drawings, requires a different UI design and I, as the teacher, shouldn’t have assumed Zoom’s whiteboard would accommodate both interaction needs. In addition, I ignored the third of my guiding questions - I didn’t turn the student’s physical constraints into a positive. Another approach could be to have

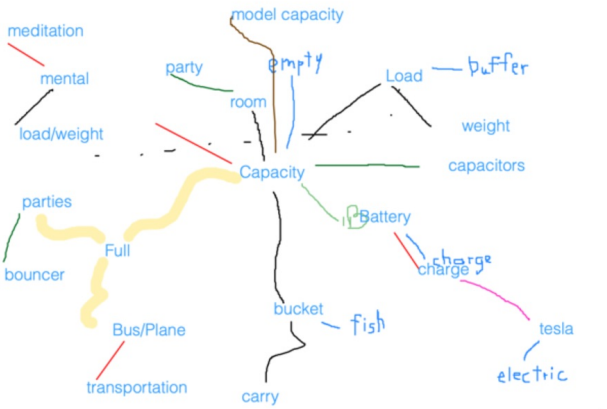

Fig. 3. A collaborative word web created in a Zoom online class using the built-in whiteboard. The central word was “capacity”.

students draw sketches on sticky notes and post photos to an image board (using Pinterest or some other similar tool). On the whole this activity presented more challenges to being run virtually while still fully addressing my three guiding questions.

5 Conclusion

The coronavirus pandemic seems certain to snarl fall teaching plans, requiring many data visualization learning environments to stay online. We hope these two examples of translating hands-on participatory data visualization learning activities to the virtual setting are valuable to workshop participants. Intentionally designing virtual participatory data visualization learning activities requires us as educators to constantly revisit our guiding principles. I have shared an initial three in this article and discussed how they informed my process - retaining pedagogy and learning goals, carefully considering technological affordances, and taking advantage of student’s physical constraints.

Acknowledgments

I’d like to thank artist Tova Speter for introducing me to the word web activity, Emily Bhargava and Catherine D’Ignazio for comments, and my students for surviving the ups and downs of a turbulent semester.

References

[1] R. Bhargava and C. D’Ignazio. Data sculptures as a playful and low-tech introduction to working with data. In *Designing Interactive Systems*, 2017.

[2] R. Bhargava, R. Kadouaki, E. Bhargava, G. Castro, and C. D’Ignazio. Data murals: Using the arts to build data literacy. *The Journal of Community Informatics*, 12(3), 2016.

[3] C. D’Ignazio and R. Bhargava. Creative data literacy: A constructionist approach to teaching information visualization. *Digital Humanities Quarterly*, 012(4), 2018.

[4] J. Gray, L. Chambers, and L. Bounegru. *The Data Journalism Handbook*. O’Reilly Media, Inc., 2012.

[5] A. V. Moere and S. Patel. The physical visualization of information: Designing data sculptures in an educational context. In *VINCI*, 2009.

[6] S. Papert. *The Children’s Machine*. Basic Books, 1994.

[7] U. H. Syeda, P. Murali, L. Roe, B. Berkey, and M. A. Borkin. Design study ”lite” methodology: Expediting design studies and enabling the synergy of visualization pedagogy and social good. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, CHI ’20, pp. 1–13. Association for Computing Machinery, 2020. doi: 10.1145/3313831.3376829

[8] J. Wolfe. Teaching students to focus on the data in data visualization. *Journal of Business and Technical Communication*, 29(3):344–359, 2015. doi: 10.1177/1050651915573944