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+TOOLKIT FOR CROSS-DISCIPLINARY WORKSHOPS

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TOOLKIT FOR CROSS-DISCIPLINARY WORKSHOPS

Open Post Academics

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BACKGROUND

Open Post Academics (OPA) is known for its **online collaborative workshops** (Open Workshops), which bridge best practices from the open science community and the worlds of social science, the humanities and pedagogy. Open Workshops are designed to allow **simultaneous multi-modal participation**: visually, onscreen; verbally, via spoken word; digitally, through shared screens and a shared Google doc where people can type their contributions in real time. Using multiple modes of participation ensures that a wider variety of voices and perspectives can be heard, and allows people to collaborate in the way that feels most comfortable and productive.

In the summer of 2020, OPA explored designing and leading an online event project that would bring those strengths to the open data science community. With the support of a grant from Code for Science and Society, Borhane Blili-Hamelin, Co-Director of OPA, Beth M. Duckles, Co-Director of OPA and Marie-Ève Monette, OPA Advisory Committee Member, designed and led the Open Problem Workshop Series pilot, a series of two events held in June 2021: a **multi-stakeholder Problem Scoping Workshop** and a larger **public-facing Open Problem Workshop**. Our goal was to develop an approach to cross-disciplinary events that 1) would leverage insights and participation from across disciplines 2) help explore the fit between problems in the data science community and resources of PhDs from outside data science and 3) create a model adaptable to other kinds of cross-disciplinary collaborations.

In this process, we uncovered **three core insights** and **five guideposts** for building successful cross-disciplinary workshops. This document articulates those insights, and invites readers to look at the specifics of our Open Problem Workshop Series pilot as a case study in how to turn those insights into action, especially in the challenging conditions of

online-first events. For those interested in hosting a cross-disciplinary workshop, we have assembled a **toolkit of nine activities** and suggestions for how to facilitate those activities in an online, collaborative setting.

WHAT IS CROSS-DISCIPLINARITY?

We take **cross-disciplinarity** to be a generic term covering **any work that brings together expertise, insights, and problems from different disciplines**. Traditional classification of work across disciplinary boundaries often centers on the extent and manner in which knowledge and processes from the different disciplines get integrated and merged, with the terms multidisciplinarity, interdisciplinarity, and transdisciplinarity being used — in that order — to pick out increasing degrees of integration between the disciplines. (See e.g. National Research Council (2014), pp 43-6.) As we use the term, cross-disciplinarity covers all of these cases, no matter the extent or manner of integration of the disciplines involved. (See e.g. Hubbs, O'Rourke, and Orzack 2020.)

It's hard for people to connect across disciplines. There are so many different ways of looking at problems, and a lot of different jargon and language we use. There is also a fundamental distinction in what people are aware of, that is, in their different knowledge bases.

These conversations are difficult because there is often little experience undertaking them, nor are people certain how to move forward when they see the value of them. **We created this toolkit to talk honestly about the challenges of cross-disciplinary conversations and to offer up some suggestions on how to have these conversations more broadly.**

CORE INSIGHTS

OPA initially developed our approach to collaborative workshops with the goal of fostering cross-disciplinary conversations among our members — academics in diverse fields spanning the humanities and social sciences as well as STEM fields. OPA members are especially good at explaining topics within their discipline, engaging in cross-disciplinary dialogue, and using pedagogical expertise to facilitate collaborative online workshops.

Building on these strengths of the OPA community and drawing on the Mozilla Open Workshop Model (Schley, Duckles and Blili-Hamelin 2020) , we developed the Open Problem Workshop Series pilot. In executing the pilot series, three foundational characteristics of effective, open cross-disciplinary discussions came to light:

(1) Cross-disciplinarity requires relationship building

For cross-disciplinary conversations to work, people need to feel welcomed, comfortable, and safe. A foundation of trust and common ground is required before more challenging topics can be addressed.

By developing personal relationships, people who are in different fields can bridge knowledge domain gaps more effectively. Having a personal connection makes it easier to speak honestly about knowledge gaps, methodological shortcomings, and intellectual differences engendered by disciplinary, professional, or occupational specializations.

Building relationships takes time. The more time spent breaking down differences and building common ground, the more that people are willing to keep talking and working through the discomfort they may feel working in areas beyond their areas of professional or academic training.

Although relationship development is an ongoing process, it is still entirely realistic to include relationship building activities in the context of an online workshop. Our activities section below considers how we did this for the Open Problem Workshop Series and we encourage anyone doing cross-disciplinary work to build in spaces where people meet and get to know one another before launching into the main discussion, problem, or project collaboration.

(2) Participants need socialization with norms that foster cross-disciplinarity

Every workplace, profession, and discipline has its own set of cultural and behavioral expectations. Socialization, or the process of creating and setting group culture, is key to bridging those disciplinary divides, and therefore is essential for successful cross-disciplinary work.

We have found culture can be consciously created through the articulation of norms, or guidelines for conduct within the group setting. For instance, in all OPA activities, we include our code of conduct, review it at the beginning of each event, and talk specifically about who people can reach out to if there is a violation of the group norms.

For the Open Problem Workshop Series, we found that it was not enough simply to describe the norms. **Participants need to see them in action, learn to act on them, and convert them into new habits.** In the Workshop Activities Section below we will discuss the activities we used to support the overarching goal/objective of the workshop. We found that activities needed to be led in a way that cultivated an empowering and safe cross-disciplinary environment. Our hope was to

enable attendees to walk away with habits they could bring to new cross-disciplinary situations.

(3) Scaffold activities to lower barriers to participation and achieve goals

Activity scaffolding is a term drawn from the field of pedagogy and it is a curricular design model that sequences activities as a ladder or a progression, and it helps to address a challenge to effective cross-disciplinary collaboration.

By definition, participants in a cross-disciplinary conversation do not have the same training, knowledge, experience, or skills. The playing field is not even--sometimes it is not even the same field: it is the equivalent of asking a soccer player, a baseball player, an equestrian, a gymnast, and a speed skater to join a WNBA player for a game of hoops.

We found that cross-disciplinary workshop activities needed to be sequenced and built to make attendees feel comfortable learning new perspectives and empowered to experiment together with them.

In the Open Problem Workshop Series, we designed a scaffolding process: we introduced content, demonstrated that material or skill, invited attendees to experiment and play with it, and then gave them the opportunity to practice using it. This ensured that everyone was using the same tools and that no one felt left behind in the conversation.

While this toolkit gives some suggestions about how to scaffold activities in cross-disciplinary workshops, we also encourage people exploring cross-disciplinary work to consult with a professional with experience in curriculum design. Designing scaffolded activities is a skill that people with a history of teaching and working with students, including many OPA members, have developed through repeated use. Pedagogical experts can create a set of activities to walk people with varied backgrounds through complex or challenging topics.

HOW TO USE THIS TOOLKIT

The workshops we led for this grant were designed for people who identify as data scientists and people with a PhD from fields outside of data science. We felt that a workshop like this would be likely to create connection and communication across these groups.

We believe that these two groups could be ANY kind of two (or more) groups with specialized knowledge that need to have conversations with one another. As such, we created a document to share the cross-disciplinary guideposts for the work we did as well as specific tools that we used. Our hope is to share these findings so that others can adapt and use the guideposts and activities for creating their own cross-disciplinary conversations.

To follow our scaffolded approach, which invites attendees to engage in activities sequenced as a ladder or a progression through the topic of the workshop, **we encourage you to follow the activities in the order presented**. That said, you may certainly pick and choose among the activities that would be most useful to your group.

We think of the **guidepost** section and the **activities** section as going hand in hand. Norm setting with guideposts cannot only be a matter of hearing and agreeing with the words: norm setting becomes more empowering and transformative when it is paired with activities that invite exploring these norms through experience and collaboration. Our mindset in describing the guideposts and activities below is to illustrate how **norm setting** and **activities** can be combined into workshops that help improve cross-disciplinary collaboration by *doing*, rather than merely by telling.

GUIDEPOSTS

Cross-disciplinary conversations bring people with different knowledge, experiences, backgrounds, and levels of expertise together, with the purpose of identifying problems and brainstorming potential new ways of addressing them. This can lead to invigorating exchanges, where new ideas are shared and common and differing problems may be identified and addressed.

The cross-disciplinary nature of these exchanges also means that some participants may know more than others about certain topics, and that different perspectives may challenge and question some of the participants' way of seeing their work. **It's important to keep in mind that these conversations can be exciting and uncomfortable at the same time.** This can have an impact on the dynamic of the group.

To create the most positive productive space for participants that takes these potential reactions into consideration, we created the following guideposts. We encourage folks doing cross-disciplinary work to adapt these principles to their own work, in order to be more clear about the task of having discussions across specialized domains and groups.

At the Open Problem Workshop Series, we introduced each of these guideposts briefly at the beginning and expanded on them before the activities focused on exchange, problem identification, and brainstorming.

(1) When in doubt, get curious

→ We encourage you to turn to curiosity.

→ Ask people what might seem like simple questions; it's ok that you're a beginner in someone else's field of expertise.

(2) Much of cross-disciplinary work happens in translation

→ Being willing to explain what you know is a gift to others.

→ If someone doesn't understand a point you're making, it's often a question of language. Go back to the language that you're using and see if you can say it differently.

→ Share your newly found knowledge!

- Create a project Glossary

(3) Cross-disciplinary conversations can feel slow

→ Translation — including between the languages of different disciplines — takes time; it's a stop and go process, between exchanging ideas and pausing for clarification.

→ Think of inclusive ways to slow down for clarification so that everyone is a part of the exchange.

(4) Work with a generative mindset

→ Be mindful of being critical, argumentative, or evaluating

- We encourage people to focus on a growth mindset when working in cross-disciplinary settings.
- Sometimes we can be well-meaning in bringing a critical lens from our fields. For people in other fields, this may not feel constructive. Try to build on and work with what others bring to the discussion instead of being critical:
    - Be wary of using "well, but..." as a default. Consider defaulting to "Yes, and!" instead.
- Be kind.

(5) Both excitement and discomfort are part of the process

- Playfulness and feeling safe to experiment are key to cross-disciplinary conversations.
- Be mindful of your discomfort. Leaning into discomfort can lead to breakthroughs, but please consider your limits and the limits of those around you. It's important to lean in carefully, respectfully, and safely.
- We use a Pedagogy of Discomfort as a foundation for inquiry, expansion and (self-)reflection.

ACTIVITIES

To contextualize these activities, we invite you to follow the agenda for the Problem Scoping Workshop and the Open Problem Workshop.

This section outlines nine scaffolded activities we did during our Open Problem Workshop Series because we see the importance in "doing" cross-disciplinarity through **building things together**. This theme ran through our approach to the workshops and the conduct of the workshops themselves.

We provide a **description** for each activity, along with a discussion of how to **facilitate** the activity, of how to **evaluate** its success, and if applicable, which other activities are related.

(1) Pre-Survey

One week in advance of the Problem Scoping Workshop, we did a short survey designed to get information that we could prepare to make the workshop more engaging. We asked several questions but had two specific goals for the workshop design: to create a list of expertise that encompassed all of the different participants at the workshop and to create a list of problems that folks saw in the field of data science.

To get data on expertise at the workshop we asked :

→ "Please list 5 areas/topics that you have expertise in (separate by commas)"

To get data on the problems that folks saw in the field of data science we asked:

→ "Please list up to 5 challenges that you believe exist in data science (separate by commas)."

We condensed the list of expertise and offered it to the whole group at the start of our conversation so that participants could see the overlapping areas of expertise and interesting backgrounds in the room. The intent was to help data scientists see that there was unique experience available to them in the workshop, and for experts to see that their experience was valued. We hoped this activity also made it clear that we equally valued all backgrounds.

The second part of the survey, on problems, was meant to guide those who attended the Problem Scoping Workshop and help us start the discussion of problem selection for the workshop. Before the workshop, the leadership team took the list of problems and did some rough qualitative coding, essentially seeing what themes emerged from the responses.

During the Problem Scoping Workshop, we asked whether the problem themes generated by the survey were accurate and if there were additions/changes to be made to them. We then used the themes as the basis for breakout group discussions. This allowed us to have specificity in the discussion and to make sure that all voices could be heard.

Interestingly, at our Problem Scoping Workshop, one of the themes that emerged was the challenge of cross-disciplinarity in the field of data science. While this is a "meta" theme (e.g. we are doing a cross-disciplinary workshop on the problem of cross-disciplinarity in data science), the topic seemed to have the most interest and to map on to the discussions we were having. At the end we chose the challenges of cross-disciplinarity as a way of narrowing the Open Problem Workshop to follow.

Facilitating activities based on a pre-survey

→ See this activity in action in the workshop agenda

Facilitation of the pre-survey results is the pre- work for the Problem Scoping activity (Activity #5 below).

For those who use pre-surveys in a cross-disciplinary setting, we encourage you to use open-ended questions that you roughly categorized as a way of making sure that multiple voices are heard beyond just those who are willing to speak up first during the workshop. By making it possible for people to "speak up" in an online setting prior to

the workshop, all voices are made available, and not just those who are willing or able to unmute and talk publicly during the workshop.

Evaluation

One of the ways we judged that the pre-survey was successful was that the discussion was engaging and many workshop participants participated based on what they saw in the survey results. In the discussion we also observed people taking cues from what other participants typed into the written document, thus making it possible for those who weren't as comfortable speaking out loud to help set the agenda for the discussion.

(2) Cross-disciplinary Ice Breakers

In a time-starved world, it can be easy to dive right into the task at hand. When we do that in a cross-disciplinary setting, we bypass an important component of these workshops: to connect people with one another. **If we want workshop participants to connect and to work together, we need to model this outcome from the very beginning.** Participatory modeling is the purpose of the ice breaker question.

The ice breaker question was the first activity of both the Problem Scoping Workshop and the Open Problem Workshop, and took place immediately after welcoming participants to the event. The question we asked at the beginning of the Problem Scoping Workshop was: "What's a game you like playing?" The answers to this question showed us that some of us liked the same games and gave us an insight into people's interests.

Sharing commonalities, getting to know people, practicing curiosity, and learning from others--what the icebreaker question encouraged participants to do--were essential to the Problem Scoping Workshop, whose goal was to be curious and to learn from the perspectives of data scientists and people with a PhD, and to get to know people in different fields.

Facilitating the Ice Breaker

See this activity in action in the workshop agendas:
→ for the **Problem Scoping workshop**
→ for the **Open Problem Workshop**

A few tips for facilitating the ice breaker. It can be helpful to think of questions that get participants in the mindset of the workshop activity, either because it is a question that is approachable and easy to answer with others, or because it helps to get the participants thinking about what you'd like them to consider.

Depending on how long the session or workshop is, you can dedicate 5-10 minutes to this activity. People can answer the question in a shared Google doc through simultaneous writing, or in Zoom break-out rooms (or equivalents) by talking with each other, or both.

Here are a few examples of ice breaker questions you can use:

→ What's a game you like playing?

→ What's a new hobby or skill you would like to learn?

→ What superpower would you like to have?

→ What would you do for work if you didn't do what you do now?

→ What are 5 things you have in common?

Evaluation

When we asked groups of attendees in breakout sessions to find "What's a game you like playing?" in the Problem Scoping Workshop, our aim was to encourage people to bring a sense of play into the workshop, to see if they had commonalities, and to encourage curiosity about any differences. It meant that they were seeking common ground and hopefully facilitating a willingness to talk to one another later in the workshop.

(3) Asking Open Honest Questions

In this activity, we drew from Parker Palmer's work on Open Honest Questions to ask attendees to the workshop to reflect on the asking of questions. Our aim was to show participants how to get curious and to ask for what they needed to be able to engage in cross-disciplinary work.

We introduced the concept by saying that open honest questions have the following attributes: they are questions that you don't know the answer to, questions that you're genuinely curious about, and questions that support the group's goals.

We then asked folks to collaboratively write questions that would fall in different types of open, honest questions such as

1) Questions that move the group forward
    - What is our next step?
    - What are we trying to accomplish?

2) Questions to clarify terms or misunderstandings
    - Could someone explain what ___ means?
    - Could you give an example?
    - I'm curious what you mean by ___

3) Questions to ask when there is tension in the group
    - It seems like we might be on different pages, can we see where we diverged?
    - Can we identify some of the different perspectives at play here?

During the session, participants wrote down their own ideas for questions in each category in the shared Google doc in order to brainstorm the kinds of things they could ask. We encouraged attendees

to use these questions in workshops going forward such as in breakout rooms or the fishbowl activity.

Facilitating Open Honest Questions

→ See this activity in action in the workshop agenda here

We used the collaborative document to encourage folks to share ideas of questions they might use, but it is also possible to ask folks to share questions verbally or in a chat window. Ideally, the facilitator has several extra open honest questions prepared and is also able to redirect the discussion when a question does not move the conversation forward or does not support the group's goals.

Some care may also be taken to discuss that questions have to be considered in terms of their context. The same question with different power dynamics and in different tones of voice may be either open and honest or not depending on the situation. The facilitator could encourage attendees to use open honest questions going forward and to think about times when they have been asked such questions.

If time allowed, the facilitator could also create an exercise for participants to practice asking each other open honest questions.

Evaluation

The purpose of focusing on question asking is to ensure that folks feel heard and to practice the kind of behavior that we'd like to see in a cross-disciplinary context. Talking specifically about the questions we might ask and having participants pull together question ideas gives them a set of things to do in breakout rooms.

To evaluate this activity, consider how well the conversations went and how many questions were used in breakout rooms and group discussions. Consider asking questions in a final evaluation on the quality of the discussions and if participants felt listened to in the workshop.

(4) Fishbowl Discussion

The Fishbowl activity is an ideal way to **get every participant to start engaging in the conversation.** During the Fishbowl, we invite some participants from the group to keep their cameras and microphones on, while we invite others to turn off their cameras and microphones. (see Tech Instructions below). Participants whose cameras are still turned on are then the only ones who appear on screen; they are in the "fishbowl."

Fishbowl participants ask each other questions and share ideas and opinions about the topic of the workshop, while those whose cameras have been turned off listen to the ideas being discussed. Participants alternate between these roles; that way, they can be both active contributors and listeners during the course of the Fishbowl discussion.

For our Problem Scoping Workshop, we conducted three rounds in the Fishbowl and gave approximately six minutes for each round:

Round 1: Data Scientists in the fishbowl

→ Talk to us about what problems you think exist in the data sciences.

→ Feel free to share what you already wrote about in the survey.

Round 2: People with PhDs in the fishbowl

→ Discuss with your fellow PhDs some of the questions that you had while listening to the data scientists.

→ What would you ask the data scientists?

Round 3: Data scientists in the fishbowl

→ Discuss with your fellow data scientists some of the questions that you heard the people with PhDs discuss.

→ What would you ask them about the insights and questions they just shared?

Facilitating the Fishbowl

→ See this activity in action in the workshop agenda here

This will very likely be a new activity for participants, which requires handling technology in a way they may not have done before. That is why a tech break, during which you will walk them through how to turn cameras and images off, is necessary before starting this activity. When explained clearly, this takes less than 5 minutes.

TECH INSTRUCTIONS

Make sure as facilitator that you take time to help folks understand the technology instructions. Here is our script:

"We're all going to do something right now together which will change the way we use Zoom. Please follow along as we do the following:

1. Go to the camera icon and click "Stop Video."
2. Click on the arrow next to the camera icon.
3. Choose Video Settings.
4. The Settings window will appear.
5. Scroll down and click on "Hide video for non-participants." Make sure that box is checked.
6. Close the Settings window and go back to the meeting.
7. Click on the camera icon when you are invited to do so.

INTRODUCING THE ACTIVITY

Before beginning the activity, it's a good idea to briefly explain how it will go and to remind participants of the cross-disciplinary **guideposts** mentioned earlier in the session.

- → We know that there isn't always a perfect distinction between people with PhDs and data scientists. If you are in a position where you fit into both categories, please pick one and stick with it for the duration of this activity.
- → Be mindful that you let others talk.
- → Questions can be asked and not answered. We are not looking for

solutions in this activity.

→ Refer back to the cross-disciplinary guideposts if/when you need to.

→ This is a great opportunity to make use of the Glossary (see activity #9 below).

Evaluation

The Fishbowl is especially useful when you want different groups of experts to bring their knowledge to the discussion, while others listen in and consider these new perspectives before bringing their own to the table. It is also a great way to lay the foundations of future activities, because it can help participants identify questions, topics, and other ideas that they can all explore and discuss more deeply further on during the Problem Scoping Workshop or the Open Problem Workshop to follow.

If time allows, concluding the Fishbowl activity with a quick 5 minute debrief can be really helpful in identifying topics to explore. During the debrief, you can invite participants from both groups to share their takeaways, or note them in the space dedicated to this in the Fishbowl activity of the Google doc.

(5) Multi-Stakeholder Consultation (Problem Scoping)

To build compelling invitations to cross-disciplinary collaboration, topic selection is crucial. With this project, we tackled this challenge through a multi-stakeholder Problem Scoping Workshop.

First, we invited a core group of participants selected because they represented a comprehensive array of the kind of perspectives and disciplines we hoped to involve in our cross-disciplinary events. The task we gave participants in that initial invite-only collaboration was to select and scope candidate topics: the 'problems' we would invite the

participants to tackle in the Open Problem Workshop to follow.

This process helped **anchor our topic selection in the vast range of needs and perspectives of the groups we hoped to serve** through the Open Problem Workshop Series — i.e. our stakeholders. Doing the topic selection with a multi-stakeholder group required a deliberative decision making process. In this case, we used voting supplemented with scaffolding. We planned the Problem Scoping Workshop to last a total of 2 hours, with the voting scheduled for the beginning of the second hour.

Participants had already contributed their suggestions to the items they would be voting on through the **pre-survey**. They had been exposed to a brief presentation about the purpose and goals of the project and the consultation process, been introduced to the norms we hoped to set (our **guideposts**); and engaged in two collaborative cross-disciplinary activities.

We hoped not only that the purpose of the process would be explicit and clear prior to voting, but also that the cross-disciplinary participants in our consultation would have already deepened their empathy for the different perspectives at the table. The Problem Scoping Workshop also helped seed norms for the subsequent workshop with a core group of community members, who would then help model our cross-disciplinarity guideposts for the rest of the collaborative Open Problem Workshop's audience.

Facilitating the Multi-Stakeholder Consultation

See this activity in action
→ in the workshop agendas,
→ and in the separate document we created for the voting activity

We worked to create a space where each person in the Problem Scoping Workshop had the ability to weigh in on the topics that everyone would go in depth on later in the workshop series. To facilitate this, we used both a pre-survey to encourage the participants to put topics on the agenda and then we grouped those topics in a shared document so that they could be discussed more fully. The voting activity was coordinated through a separate document, linked in the Problem Scoping Workshop agenda.

We then invited participants to vote in the document using "+1" and to add additional options if they wanted. The facilitator then set up time for voting e.g. "We will take a few minutes right now to put plus one's in

the three areas you think are most important." Once voting time concluded, the facilitator then described what they saw, calling out the subjects that had gotten the most voting. Depending on time, they could invite people to give their comments or suggestions for combining subjects, split them up or otherwise make changes. If needed, more rounds of voting and discussion can occur until the group has settled on the final three topics for deeper discussion.

Tips for doing this are:

- → Give folks time to read through the themes and to add to the items in the categories if they want.
- → Ask if participants want to make changes to the name of the subjects or what's categorized under these subjects.
- → Be open to conversations about the voting process and to do several rounds of voting to settle on the final topics for the breakout room discussions to follow.

Evaluation

We know that this is successful when there is productive discussion that results in meaningful interactions and conversation across disciplines, and when the group has reached a common agreement on the final three topics to be addressed in the following breakout room discussions. Much of this activity can be evaluated in the final workshop evaluation where participants are able to share that they were interested in the discussion, that the conversation was productive and the workshop ended up talking about issues that mattered to participants.

(6) Panel Presentation

For the first hour of Open Problem Workshop, we asked five participants who had attended the previous multi-stakeholder Problem Scoping Workshop to each give four to five-minute talks on an insight on cross-disciplinarity from their field or work. We also asked them to be participants and contributors throughout the workshop after their

presentation.

The panel was one of the first activities in the Open Problem Workshop from which the remaining activities were scaffolded. During this panel, we invited the five presenters to introduce new content about cross-disciplinarity. The fields and concepts discussed in these presentations provided examples of the diverse types of expertise we would invite participants to share in the more collaborative activities that would follow.

We anticipated that this panel would provoke curiosity in the participants and introduce possible topics to explore, while also allowing them to acknowledge some of the challenges we faced in a cross-disciplinary dialogue, namely the translation work required to understand other fields and still actively participate. In this sense, the panel was the first step towards inviting attendees to experiment and practice considering different disciplines to address the issue of cross-disciplinarity in data science in the activities that followed.

Facilitating the Panel Presentation

→ See this activity in action in the workshop agenda here

The panelists who were data scientists were asked to address why cross-disciplinarity is an important and challenging issue for data science. The four experts coming from other fields were asked to explain one or two concepts/ideas from their area of expertise/work that related to cross-disciplinarity. Each had five minutes to present their expertise.

Before the Open Problem Workshop, panelists were encouraged to work with our team if they wanted to, on the topics they were interested in talking about, asked to keep jargon to a minimum and to use only a few presentation slides if needed. They were invited to bring what they had already done to this conversation and reminded that they only had five minutes each.

Evaluation

In retrospect, we should have budgeted more time for each person as the materials folks were bringing were relevant, timely, and useful for the discussion. However, we would have had less time for the interactive portion of the workshop if we had made it longer so it was a tradeoff. One

way we could have worked with this was to ask panelists to tape these talks ahead of time for pre-viewing, so during the workshop the panel could focus on conversations. Although this format revision may have been preferable, we did think the content of the panelists' talks was a useful starting place for further discussion by all workshop participants.

We recommend incorporating panels into cross-disciplinary conversations when the goal is to introduce participants to multiple options to draw from in conversations across fields and expose everyone to the same content. That said, if the goal is to work on a problem or a question and to develop deeper conversations, a panel may not be as effective as a single more in-depth presentation. There is a tradeoff between diversity of options being seeded into the conversation, and specificity and depth.

(7) Matching Problems to Insights (Collaborative Writing Task)

We wanted the culmination of our workshop to be actual collaboration between the data-scientists and the PhDs from other fields. To that end, we structured the Open Problem Workshop's second hour around two realistic collaborative tasks (Activities #7 and #8) that both involved **collaborating on new insights**.

The first insight-generating activity (Activity #7) was meant for medium sized groups – from 6 to 20 participants. The activity is built around simple prompts to which we ask the whole group to respond, similar to a focus group.

We used the following two prompts:

- → List out specific **challenges** with cross-disciplinarity in data science. (Feel free to rehash or reword anything you've already heard today as well as add anything from your background/expertise.)
- → List out **insights** from Ph.D.'s outside data science that might help with the above challenges. (These insights can include anything that

you have already heard in the workshop today as well as add anything that is from your background/expertise.)

In a first step, the whole group publicly records answers to the prompts through a collaborative virtual document (Google docs, etherpads, etc.) As this is happening, the participants are invited to read each others' answers. This can be supplemented with a moderator reading the answers out loud.

When participants agree with an answer that another participant has written, they are invited to signal agreement by annotating the document. We used the convention of adding '+1' to answers. We do so not merely to avoid redundant answers, but to free participants to surface experiences that have not yet been captured by other answers.

The responses to these prompts generated a list of challenges and insights. For the second insight-generating activity, we invited the participants to attempt to match items from the two lists: so that **challenges would get matched to insights that participants found worth exploring** in addressing each challenge.

Facilitating Collaborative Writing Activities

→ See this activity in action in the workshop agenda here

We facilitated this writing activity as a collaborative writing exercise by coming up with a sequence of prompts that we then invited participants to respond to in writing on a collaborative virtual document (such as Google docs, etherpads, etc.). A virtual whiteboarding platform like Miro or Jamboard could also be used instead. As this happened, the participants were invited to read each others' answers. This could be supplemented with a moderator reading the answers out loud. When participants agreed with an answer that had already been written, they were invited to signal agreement by annotating the document. We used the convention of adding '+1' to answers. In this way we encouraged participants to surface ideas that hadn't yet been captured by other answers.

The three prompts we used for this problem matching exercise were:

1. ⚠ Challenges: List out specific challenges with cross-disciplinarity in data science. Feel free to rehash or reword anything you've heard already today as well as adding anything from your background/

expertise.

2. 💡 Insights: List out the insights from PhDs outside data science that might help with the above challenges. These insights can include anything that you have heard already in the workshop today as well as anything that is from your background/expertise.

3. ⚠ Challenges + 💡 Insights Matches: Create at least 10 matches between specific challenges with specific insights from the above lists

We encourage you when building your own sequence of writing prompts to be mindful of how you scaffold the prompts. How much support do the previous activities of the workshop provide for the writing task? Will folks who come to the table with little prior knowledge find ways to navigate the prompts? How do the prompts work together as a sequence? Are they likely to surface the kind of insights or ideas you want to invite participants to explore? Be sure to dedicate appropriate time to each writing prompt. It can take some trial and error to fine tune collaborative writing prompts.

We have used facilitated collaborative writing successfully with group sizes of anywhere from 3 to 25. If groups are much larger than 25, we prefer splitting the audience into subgroups, each with their own collaborative writing document. In this case we split our audience of 55 participants into 3. For this workshop, we wanted all participants to have access to the entire pool of challenges + insights matches generated in the breakouts. We supported this by pasting the results of prompt 3 in the breakouts into a single shared list.

Evaluation

This challenge + insight matching activity (Activity #7) can be understood as a divergent co-design process: we recommend using this kind of collaborative writing activity when the **goal** is to rapidly generate multiple options that the participants perceive as worth exploring.

Participants in the workshop successfully generated 25+ pairs of problems and insights. For instance, participants matched the challenge of "Jargon-y, siloed knowledge" with the insights of "investment (of time and resources) in roles emphasizing communication and translation." The activity was also successful in enabling participants to tackle the

next workshop activity (Activity #8), which required them to build on the results.

(8) Interventions Brainstorm

We followed the divergent matching activity (activity #7) with a convergent co-design activity: participants were invited to select one among the many options generated by the challenge + insight matching activity and to explore in more detail how it might be converted into action.

We invited participants to broach the task of converting the challenge + insight match they select into action through the following instructions:

→ What actions and interventions might help convert our challenge + insight matches into real-world solutions?

→ You'll now be put in your final breakout of 3-4 people, who may or may not have been in your last breakout group. Introduce yourselves and then:

- With your group, choose ONE insight + challenge pair from the list above
- With your group, think of one LOW effort/time/resource intervention for that pair
- With your group, think of one HIGH effort/time/resource intervention for that pair
- If you have time, do another one!

Facilitating Interventions Brainstorm

For the purposes of a collaborative workshop, it is crucial to set realistic expectations around this kind of convergent selection and refinement task. Our goal with this activity was to provide participants with a cross-disciplinary collaboration task they could realistically accomplish in

small breakout rooms of three to four participants within 15 to 20 minutes.

→ See this activity in action in the workshop agenda here

To be sure each breakout room involved a close to even split between data scientists and PhDs from fields outside of data science, we relied on the data collected through our ticketing platform for the event regarding how participants identified (as data scientists or as PhDs).

Evaluation

Small groups can work well for tasks that involve selection, prioritization, and fine tuning. In this case, we were looking to invite participants to begin thinking about actionable steps they could realistically take to build on the insights of activity #7. On that front, the activity had mixed results. It jumpstarted 'intervention' conversations, but left many participants eager for more opportunities to follow through.

As a sequence, activity 7 & 8 are worth considering in a setting where participants will be given more opportunity to follow through after the activities: be it a project incubator, a collaborative working group, a hackathon, or even perhaps in the context of a multi-week class. In the context of a one time workshop, we are curious to explore what sequences of divergent and convergent collaborative tasks might be similarly generative and engaging, while giving participants more sense of closure and accomplishment.

Another goal we had with this activity was to give participants a taste of small group cross-disciplinary collaboration.

(9) Glossary

One of the challenges we saw in cross-disciplinary conversations was miscommunication, difficulty in sharing information, and imperfect knowledge transfer that happens when disciplinary experts use jargon or acronyms in a way that included some people and excluded others.

To address this challenge, one of our ideas for the Open Problem

Workshop Series was to create an ongoing glossary of terms where people could both ask what a term meant and respond with definitions from their field.

Our hope for the glossary was that workshop participants would investigate the "common" jargon and phrasing that is typical in insider communities in a non-confrontational way. This would mean that someone could ask the question and have it answered without feeling like they were asking a "stupid" question.

Facilitating The Glossary

We introduced the glossary at the beginning of the workshop in hopes that people would use it throughout the workshop. In reality we should have spent more time explaining it and offering up examples of how we might do that. We suggest that if you use a glossary that you give multiple prompts to encourage its use and to return to the terms discussed in it.

Evaluation

→ See this activity in action in the workshop agenda here

While we did present this idea and had a space in the shared document for participants to create a glossary for our discussions, in reality it was not well used at these workshops. In the future, we would likely spend more time encouraging attendees to use it, or consider different methods of introducing or integrating it into the work.

A cross-disciplinary glossary might also be more effective for longer engagements or conversations that were more technical in nature. It could also become a live and supporting document should participants decide to explore some of the options generated by the interventions brainstorm activity beyond the workshop itself.

We encourage other groups to experiment with this idea and adapt it to their workshops.

CONCLUSION

As we mentioned at the beginning, the process of developing this workshop gave us three key insights about cross-disciplinary dialogues. These insights are relevant for a variety of event types from project incubators, collaborative working groups, hackathons, or cross-disciplinary courses:

1. Cross-disciplinarity requires relationship building.
2. Participants need socialization with norms that foster cross-disciplinarity.
3. Activities need to be scaffolded in order to lower barriers to participation.

These three insights are interconnected, so the process of creating a workshop or a series of workshops that will address complex cross-disciplinary content needs to integrate all three. The building of relationships is related to the ability to promote the socialization of norms among participants and helps to make the scaffolding more compelling and productive. Creating norms that make participants feel comfortable with expressing their curiosity while also potentially questioning the approaches and perspectives of others helps to create closer relationships, more open dialogue, and therefore make it possible for all to be engaged in the work. By scaffolding the workshop effectively, and we build on that dialogue while acting out the norms set. As a result, closer relationships are created between participants.

Both the Problem Scoping Workshop and the Open Problem Workshops held in June were the first edition of the Open Problem Workshop Series. Like any experimental project, we learned a lot about the things that worked and the questions that arose once it was finished. On the one hand, we believe that the experience we designed left participants with an empowering model of how to facilitate cross-disciplinary

dialogue. We wrote this toolkit because we felt this to be the most helpful insights we uncovered.

On the other hand, the limitations of a two workshop series felt like it left too little room for pursuing action and making those insights more functional in the data science community. We realize that an additional workshop or two, focused on acting on actionable interventions brainstormed during the Open Problem Workshop, could have led to collaborations between participants and the implementation of these interventions beyond the event. Our original idea of doing four workshops would have generated at least two times the actionable interventions and would have also enabled more connection and community to encourage the kind of forward thinking needed to lead these interventions into action.

However, facilitating a Problem Scoping Workshop and an Open Problem Workshop as we did in June of 2021 can still be an extremely useful seeding stage for a project incubator or a hackathon process in which participants are given opportunities to follow through on the ideas that emerge. The model, as is, can be used by teams in the data science science community, but also by other communities of excerpts and even grant funders looking for more innovative projects to fund.

We see the Open Problem Workshop Series as holding a lot of potential to facilitate cross-disciplinary dialogue, whether it is used in a project incubator phase, or with the hopes of leading towards implementing actionable interventions. Our hope is that people will take the activities shared in this toolkit and adapt them for their own needs. We'd love to hear what you come up with! Send us an email at openpostac@gmail.com.

RESOURCES

- The Center for Scientific Collaboration and Community Engagement (CSCCE) has materials that are useful for developing workshops.
- For more about the Open Workshop Model based on work with Mozilla, Schley, Sara, Beth M. Duckles, and Borhane Blili-Hamelin. "Working Open: F2F/Online and Synchronous/Asynchronous Flexibility." *Journal of Faculty Development* 34. 3 (2020): 94-95. Print.
- For more about pedagogies of discomfort: Feeling Power: Emotions and Education by Megan Boler
- The Toolbox Dialogue Initiative. Hubbs, O'Rourke, and Orzack 2020.
- Karin Knorr-Cetina's work on Epistemic Cultures
- National Research Council (U.S.), National Research Council (U.S.), and National Research Council (U.S.), Eds., Convergence: facilitating transdisciplinary integration of life sciences, physical sciences, engineering, and beyond. Washington, D.C: National Academies Press, 2014.
- Parker Palmer's resources on Open Honest Questions are linked to his work with the Center for Courage and Renewal.

APPENDIX: OPEN PROBLEM WORKSHOP STORY

In the summer of 2020, folks from Open Post Academics heard about the Code for Science & Society (CS&S) call for proposals. Since our group includes people from a wide variety of fields, we started to discuss how so many different perspectives could connect with and be of use to the data science community.

Big data and machine learning are among the transformative technologies of our time, and have rewritten how we work as a society. We now face the **monumental task of making our data driven world just, inclusive, equitable, safe, and accessible.** How can OPA help folks with PhDs bring their expertise to this task? The Open Problem Workshop series was OPA's first attempt at exploring this question.

In our internal conversations we asked: Where do the problems of open data science call for the insights of PhDs outside the data science community? Data scientists are very frequently called upon to contribute to solving the problems of other communities and we wanted to ask if data scientists had the ability to connect with experts in social science, the humanities and sciences. What if we built something that explored the relevance of outside experts to the problems the data science community was facing?

We came up with the three features of the workshop. It would be:

(1) Targeted:

- To help members of the data science community surface the specific problems they face that might benefit from the help of outside experts.

(2) Expansive:

- To expand the relevance of expertise of PhDs outside the data science to the problems of data science.

(3) Personal:

- We believe that effective bridges across expert communities cannot remain impersonal.
    - We know that collaborative, peer-led workshops are a strength at OPA.
    - For this project, we aimed to foster personal connection through the experience of a collaborative, peer-led workshop.

We imagined a workshop that:

→ Specifically targeted the problems of the data science community.

→ Allowed anyone with a PhD, including people with no ties to data science, to explore how their specific expertise might be relevant to the data science community's problems.

→ Fostered personal connection between the members of both communities, their specific problems, and their insights.

The above document is a discussion of the tools we developed and used in the workshop to have this cross-disciplinary conversation.

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OPEN POST ACADEMICS

Who we are

Open Post Academics (OPA) is an international, interdisciplinary, collaborative, peer-led community for PhDs to bring their expertise to the world, whether through a new career, thought leadership or projects to showcase their knowledge. We convene folks with PhDs and other communities through open, cross-disciplinary spaces. We rethink how real world problems call for the expertise of PhDs from all fields.

What we do

OPA offers members opportunities to engage in the community as leaders, educators, and professionals. We held an eight week OPA Fellowship program in January of 2020 sponsored by Mozilla's Open Leaders X program with the cohort graduating in March of that year. When the pandemic emerged, the needs of the community shifted to collaborating on a range of online, peer-led workshops. We also curate resources, maintain an open curriculum for post-ac career transition, and provide opportunities for networking, informal educational facilitation, and mentoring in an online community.

In 2021, with the support of a grant from Code for Science and Society, we created a workshop series (Open Problem Workshop) rethinking the relevance of the expertise of PhDs from all fields to the monumental task of making our data driven world just, inclusive, equitable, safe, and accessible. We also created a Toolkit for Cross-Disciplinary Workshops to share our insights from these pilot workshops.

Our online collaborative workshops (Open Workshops) bridge best practices from the open science community and the worlds of social science, the humanities and inclusive pedagogy. Open Workshops are designed to allow simultaneous multi-modal participation which helps to include a wider variety of voices and perspectives and allows people to collaborate in the way that is engaging and productive.

Find out more about us at https://openpostac.org/

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