

Good Afternoon. My name is Christina Chan-Park and I am the Science Librarian at Baylor University. I am going to share this afternoon about a series of science research workshops that I started in Spring of 2012 and that have evolved over the last few years.

- Motivation
- Format
- Topics
- Statistics

## **Science Research Workshops**

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I will begin by talking about my motivation for holding these workshops, then move onto the format of the workshops, then discuss the topics and the content that I cover, and then give some statistics so that you can decide whether or not offering these workshops are successful.



Part of my motivation for offering these workshops comes from my background. I had no library training before I started working as a librarian. Before coming to Baylor, I ran a professional development program sponsored by the NSF for minority STEM graduate students. Part of my duties also included running a summer undergraduate research program where the graduate students mentored the undergraduates. So, I was hired at Baylor because I knew how to teach students how to conduct research even though I did not have a library background.

From my experience, I noticed that many science professors assume that students already have research skills that they can readily apply in the lab. They take the time to teach students technical skills such as how to run a test or a piece of equipment but assume that students new to their labs already know how to read, write, and integrate or synthesize information or that they will pick up these skills by osmosis. I disagree with this assumption.

I feel that learning how to conduct research is similar to learning how to cook. There are only a handful of people who are naturals—without any background they seem to know exactly what to do. There some, but still not too many, who can figure out what to do just by watching others. So, if you watch enough times and pay attention, you can figure out how to make your grandmother’s famous apple pie. But most of us need lessons or at least recipes and lots of practice to figure out how to cook. If you spend enough time reading recipes, you will find patterns such as you almost always add wet ingredients to dry ingredients. But if someone teaches you the principle behind what you’re doing, it’s much easier for you to apply it in a different situation. And that’s what we want our students to have: transferable research skills.

My target audience for these workshops are students who are just starting research whether they are undergrad or grad. The majority of the students I get are juniors who are in the honors program working on the 2<sup>nd</sup> out of 4 semesters on their theses. Since starting these workshops, these juniors are now required to pick at least one library research workshop at attend—and I’m trying to get my humanities and social science colleagues to offer more options. However, I also get freshmen and sophomores who are interested in research but haven’t started and a handful of new graduate students and also visiting scholars.



Most of these sessions are small interactive workshops with enrollment capped from 12 to 24 students although the ideal for some of them is probably 4 to 6. We generally sit around a table allowing us to go through material together and to have conversation and questions in an informal setting.

I have found that lunchtime on Fridays (for us that is 11:15-12:05 and 12:20-1:10)) are good times as well as late on Friday afternoons (3:35-4:25 and 4:40-5:30). I also will hold workshops on Tuesday or Wednesday afternoons.

When I first started, I used a google form to manage sign-ups. This past spring, we started using LibCal. LibCal has made things much easier. I can simply copy a workshop to add new sessions, it's easy for me to check the registrations, and it sends automatic reminders to students a day before. This is especially important when I want the students to bring something with them to the session. I can also embed both the workshop calendar and signup buttons in my libguides.

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- Reading Scientific Papers
  - Writing Scientific Abstracts
  - Creating Scientific Poster Presentations
  - Scientific Research Process
  - Data Management

## **Topics**

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I currently regularly teach five science research workshops.

I would like to teach also finding datasets and an introduction to IRB, but as I have the largest department load of any of my colleagues I've left these workshops to my social science colleagues.

Other topics I would love to cover would be patent basics, simple statistics for research, data visualization, and experimental design. We have two openings right now for digital scholarship librarians so I'm hoping that after they come, we can develop more workshops.

- Types of Scientific Papers
- Reasons for Reading a Scientific Paper
- Parts of a Scientific Paper

## **Reading Scientific Papers**

Reading Scientific Papers is one of my favorite workshops to lead. I started these workshops in Spring 2013. I ask each student to bring a scientific paper to the workshop. As an introduction I go through different types of scientific papers: the standard hypothesis driven article, shorter letters, review articles, and protocol papers.

We then discuss the different reasons why one might read a scientific paper which I have just recently discovered roughly corresponds to the rhetorical analytical scheme BEAM: *Background* for materials a writer relies on for general information or for factual evidence; *Exhibit or Evidence* for materials a writer analyzes or interprets; *Argument* for materials whose claims a writer engages; and *Method* for materials from which a writer takes a governing concept or derives a manner of working. I am emphasize that during different stages of research one can read the paper for different purposes and might need to re-read the paper for each purpose.

We then go over the basic parts of the scientific paper which they generally are familiar with: abstract, background/introduction, materials and methods, results/analysis/discussion, conclusions/future work. Not every paper has every section or sometimes sections are combined.

Then I have the students read/skim through the papers they brought. As we go through each section, they share with the group about their papers. What is the purpose or the context of the paper? What are the authors trying to prove or what is the hypothesis? How does the experiment propose to prove the hypothesis? Do you think it's a good plan? What are the independent and dependent variables? Do the results prove or disprove the hypothesis? Why or why not? What are the next logical steps or hypotheses?

I also emphasize that for the first reading of a paper, it doesn't need to take too long and that the minute details are not important. However, on second and third reading, some of those details will become important.

- Different Types of Abstracts
- Length of Abstracts
- When to Write an Abstract
- Sample Abstract

## **Writing Scientific Abstracts**

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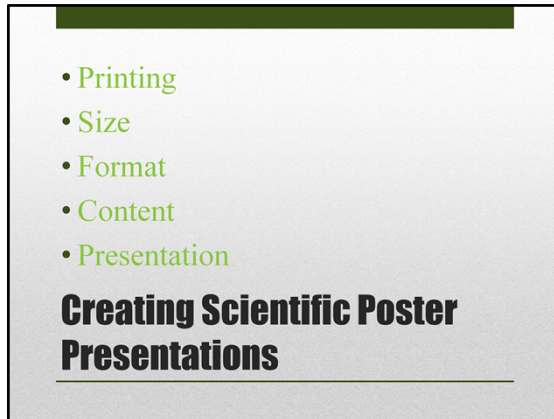
I added the abstract writing workshop in Fall 2013. For this workshop, I ask the students to come with a specific project in mind. Preferably it is a project that they are working on, but it can also be someone else's work that they are familiar with.

We begin by going over the purpose of abstracts and the idea that some of them are summaries of larger works such as a thesis or an article while others are used for proposals for conferences or grants. The summaries are generally shorter than the proposals. I've seen requirements for abstracts that range from 200 characters or about 40 words to 4 pages, but that generally abstracts are between 100-200 words for summaries and 400-500 words for proposals.

When I ask students when to write an abstract (especially a summary abstracts), they generally say at the end of the project. I encourage them to write abstracts through out their research. Often the project you start working on is not the project you finish. So spending an hour periodically to work on an abstract helps students refocus on the big picture of what they are doing and why.

We then go over a sample abstract that is about an abstract writing workshop, and the students pick out the different sections that follow a scientific paper: background, methods, discussion, and conclusion.

The students then start writing up abstracts for their projects and we spend time reading and critiquing them.



I added the Poster workshop in Spring 2014. For this workshop, I ask students to bring a figure such as an image or a table or a graph with them.

I go over some of the peculiarities of printing posters at the University Copy Center if their departments do not have large plotters they can use and suggest different software packages that they can use.

I also go over information about size: triple check the requirements regarding size and orientation;

about format: columns are easier to read, use color but your poster shouldn't look like a bowl of skittles, make sure the font is large enough and don't use too many types of fonts, make sure that there is enough white space; and

about content: label each section, use bullets instead of paragraphs, use figures rather than text, make sure everything is labeled, highlight (using color or arrows) the important points.

I avoid giving them a single template to use. We then start working on their poster or editing posters that they already have started. Students often give each other ideas. And it's good for someone who is not familiar with their research to give them feedback.

I also emphasize that they should have a 30 second highlight summary along with a longer 2-3 minute explanation of their poster.





The Scientific Research Process was the first workshop that I offered. At first it was simply called Science Research Workshop and included bibliographic instruction, but I changed the name and dropped the bibliographic instruction in Spring 2013.

What I cover in this workshop depends largely on who shows up; but we always begin with talking about the individual projects that the students are working on.

This workshop is a lot about building up the students' confidence and giving them a forum to ask questions that they think are too basic to ask their advisors.

Topics I might cover include

Original Research: students are often think that original means paradigm-shifting and not simply "hasn't been done before." They have to understand that the next logical little step that involves tweaking previous work is considered "original"

Hypothesis Testing: students often are busy learning lab techniques that they don't see the bigger picture. I get them talk through their experiments in terms of a hypothesis. What is the relationship they are studying? Why do they think that relationship exists in that direction? How are they going to check whether that relationship exists?

Non-linear path: I assure students that they will hit roadblocks. Experiments will fail. Equipment won't be available. Labmates will be uncooperative. The electricity will go out. Their initial hypothesis might not be testable or someone else may have already answered that question. They will have to back up and find detours or they will have to wait for a greenlight. What they envision when they write their proposal will not be what they end up doing and they will not be judged on how well the two match.

Project management: It turns out that most students don't know what should go in their theses. We go over what is generally covered in the different chapters and how it would be different from a journal article. We go over when each chapter should be completed and when each step of their data gathering and analysis should be completed if they want to graduate on time.

I tell them to break down the thesis to smaller goals so that it's not so intimidating to

tackle. And I reassure them that if they don't finish their thesis with the exception of those who are University Scholars, it will not affect their ability to graduate or get into med school.



I added the data management workshop in Spring 2014. This is also the only workshop that is more of a lecture than a workshop. And I'm still thinking about ways I can make it more interactive.

Originally I thought that faculty who would be interested in learning about writing DMPs would be the primary audience. But it turns out that this is one of my most popular workshops among the honors students because I get a lot more non-science majors attending this workshop.

Some of the topics we cover include Documenting how they reduce and analyze data, file types, backups, security, file naming conventions, and long-term archiving.

Much of the material is common sense, but it helps to have the information laid out clearly.

By

- Semester
- Workshop
- Day
- Time

# of Sessions	Total Attendance	Average Attendance	Maximum Attendance
59	181	3.1	8

**Statistics**

So, are these workshops successful? I haven't gathered information from the students regarding these workshops but hope to start sending out evaluation follow-up emails through LibCal this fall.

I will give you some statistics and leave it up to you to decide whether the workshops are successful. There might be some missing data since I changed the registration system and our department changed our instruction stats system during the time I am reporting on.

So far I have conducted 59 sessions with a total of 181 attendees which means an average attendance of 3.1 per session although a number of sessions have 8 attendees. I do not include any classes that were scheduled but no one signed up for.

Semester	# of Sessions	Total Attendance	Average Attendance	Maximum Attendance
Spring 2012	6	10	1.7	3
Fall 2012	3	3	1	1
Spring 2013	1	2	2	2
Fall 2013	6	18	3	8
Spring 2014	13	47	3.6	5
Fall 2014	10	26	2.6	8
Spring 2015	20	75	3.75	8

**By Semester**

As you can see, over time both the number of sessions and the number of attendees has increased. Generally, spring has more classes and higher attendance because more of the honors students are required to take one of the workshops in the spring.

Just as a reminder, I started adding more focused workshops in spring 2013 and 2014.

Workshop	# of Sessions	Total Attendance	Average Attendance	Maximum Attendance
Reading	15	56	3.8	8
Abstract	9	21	2.3	5
Poster	5	12	2.4	4
Process	22	52	2.4	6
Data	8	40	5	8

**By Workshop**

The number of sessions for each workshop type is reflective of when I started teaching that workshop. The Scientific Research Process was the first workshop I taught and then I added Reading Scientific Papers. Creating posters is not too popular but I do try to time it to a few weeks before our Undergraduate Research Day where more than 100 students present posters.

You can see that the Data Management class consistently gets the highest attendance, but this is largely due to non-science majors picking this workshop because there are fewer non-science offerings.

Reading Scientific Papers is the next popular workshop.

Workshop	# of Sessions	Total Attendance	Average Attendance	Maximum Attendance
Monday	3	10	3.3	5
Tuesday	11	26	2.4	5
Wednesday	3	4	1.3	2
Thursday	1	1	1	1
Friday	40	139	3.5	8
Saturday	1	1	1	1

**By Day**

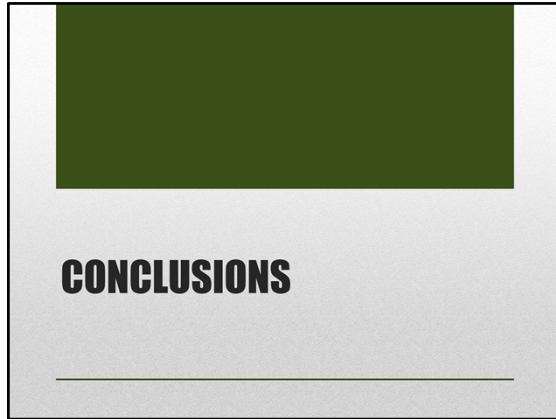
Friday is generally the best day to have workshops because there are fewer regularly scheduled classes on Fridays. Even though students tend to have Monday/Wednesday classes and Tuesday/Thursday classes. Mondays and Tuesdays are more popular than Wednesdays and Thursdays.

Workshop	# of Sessions	Total Attendance	Average Attendance	Maximum Attendance
9:30 am	1	2	2	2
11:15 am	7	23	3.3	5
12:20 pm	8	28	3.5	8
1:30 pm	3	5	1.7	3
3:30 pm	16	47	2.9	7
4:00 pm	7	16	2.3	4
4:30 pm	11	46	4.2	8
5:00 pm	6	14	2.3	5

**By Time**

As I mentioned earlier, late afternoon and lunch time are good times to hold workshops compared to mornings or early afternoon.





So, are the workshops successful and worth continuing?  
To me they are.

Some might say that having 3 students show up to a session is not worth the time to prep. But because the workshops are interactive, you don't have to prep that much.

When I compare what students ask me for help either through appointments or during my office hours in the science building, it is very different from what I cover in these sessions. Generally, my one-on-one sessions are about finding resources. So, I don't think the students would be getting this information elsewhere if I weren't offering these workshops.

The numbers each year are growing. Part of this is due to the honors students, but the fact that the honors program thinks that the workshops are worth requiring means that the content is worth learning and that the students are not getting the information elsewhere.

Also, it helps the students to interact with other students who are conducting research. Students often feel like they're the only ones who are in their particular situation when they're not. Plus it helps students to be able to explain their research to other students and to get feedback on their work.

Thank you.