

## Keeping Track of Your Recipe: Moving from Cookbooks to the Web

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Carlton, M., & Klein, J. (2021). Keeping track of your recipe: Moving from cookbooks to the web. In B. Buljung & E. Bonigiovanni (Eds.), *The Scholarly Communications Cookbook* (pp. 293-295). ACRL.



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### **Abstract:**

Gone are the days of your grandmother's written recipe on a dusty index card. The recipes of today are safe from spills by going electronic. By cooks going digital, they can now record and document their recipes in a safe environment while making them searchable and findable.

Electronic laboratory notebooks (ELNs) help researchers to manage their research, record their processes, and manage research data in ways that increase reproducibility, efficiency, and collaboration. Whether an ELN or a paper notebook, the information that is provided needs to be a detailed and accurate representation of the research record. This recipe provides an outline for a workshop on the use of lab notebooks, the pros and cons of using ELNs versus written lab notebooks, as well as steps and examples to prepare activities.

**Keywords:** research management | research record | lab notebooks | electronic laboratory notebooks

### **Article:**

**\*\*\*Note: Full text of article below**

## Keeping Track of Your Recipe: Moving from Cookbooks to the Web

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### NUTRITION INFORMATION

Gone are the days of your grandmother's written recipe on a dusty index card. The recipes of today are safe from spills by going electronic. By cooks going digital, they can now record and document their recipes in a safe environment while making them searchable and findable.

Electronic laboratory notebooks (ELNs) help researchers to manage their research, record their processes, and manage research data in ways that increase reproducibility, efficiency, and collaboration. Whether an ELN or a paper notebook, the information that is provided needs to be a detailed and accurate representation of the research record. This recipe provides an outline for a workshop on the use of lab notebooks, the pros and cons of using ELNs versus written lab notebooks, as well as steps and examples to prepare activities.

### LEARNING OUTCOMES

Students who attend this workshop/session/class will learn the following:

- Recognize the parts of a lab notebook.
- Understand the importance of lab notebooks in scientific research and scholarly communication.
- Discuss using a paper versus electronic lab notebooks.

- (Advanced option; see Chef's Note): Evaluate multiple ELN products against research needs/requirements.

### NUMBER SERVED

- 4–20 students per session
- Session would be best for undergraduates enrolled in courses that include a STEM laboratory (substitution: data/code laboratory).

### COOKING TIME

Prep time: ~2 hours depending on familiarity with lab notebooks

Session time: 1 hour

### DIETARY GUIDELINES

This lesson satiates the following frames from the ACRL *Framework for Information Literacy for Higher Education*: Information Creation as a Process and Information Has Value.

This lesson also fits into *UNCG's Information Literacy Student Learning Objectives* under our "create" category. The goal of this category is that "students will see themselves as information creators contributing to scholarly or creative conversations." The relevant outcomes under this category

include:

- Students will use advanced digital creation tools to create content in formats appropriate to their discipline or context.
- Students will make informed decisions about their own intellectual property based on publication cycles and scholarly conversations in their field.

### INGREDIENTS & EQUIPMENT

- 1 instructor station with projector/screen
- Student workstations with an internet connection
- Handout on the parts of a lab notebook
- "Lab Notebook Scenario/Group Activity: Recreating an Experiment" handout
- Instructor Kahoot account, or similar product

### PREPARATION

This session requires knowledge of the importance and use of both electronic and physical lab notebooks. The instructor can create a handout of the parts of a lab notebook in coordination with the faculty member or department (as needed).

### COOKING METHOD

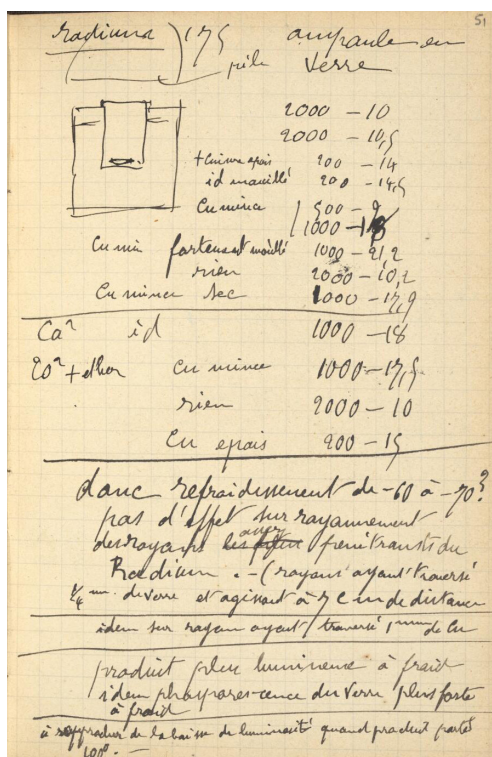
1. **Introduction to lab notebooks.** (10 minutes) This recipe starts with an introduc-

tion to lab notebooks in general, including the importance of lab notebooks in conducting and communicating research.

- Talk about the importance of a lab notebook. Why do we have them and what purpose do they serve in the research process?
  - The Pain article, *How to Keep a Lab Notebook*, gives excellent viewpoints from researchers that assist with discussion points.
  - The history and importance of lab notebooks can be illustrated by showing figure 1: Marie Curie's Lab Notebook.
- Introduce the parts of a lab notebook. Prepare a handout from Caprette's, *Examples of Notebook Pages and Entries*, which gives students an example biology lab notebook. Adapt your handout to match the requirements of your students' discipline(s), including the order of notebook sections, as applicable. Requirements for what information to include may vary depending on your discipline! Your institution may also have examples that you can use.

## 2. Activity 1: Lab notebook scenario/ group activity: Recreating an experi- ment (30 minutes)

- Separate students into groups of 2 to 5 students.
- Give students time to read and identify incomplete information. One student will read aloud the steps in the experiment below as another student from their group acts out the experiment.



**Figure 1. Marie Curie's lab notebook**

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- Other groups within the class must figure out what information is missing:
  - What questions need to be answered before the experiment can be repeated?
- Students will call out information missing from steps as they are acted out, and the acting roles will rotate to each group with each missing snippet of information until the experiment is completed.

- After the activity, discuss how many groups would have been able to recreate the experiment fully without any missing steps and the importance of complete and detailed lab notebooks to the research process.

### 3. Introduce electronic lab notebooks (10 minutes)

- Discuss the differences between electronic lab notebooks and written lab notebooks.
  - If you are unfamiliar with the differences between electronic and written lab notebooks, “The Pros and Cons of Using an Electronic Lab Notebook (ELN)” by Rebecca Talley provides a nice overview.
- Activity 2: Kahoot quiz: This or That: ELN or Paper Lab Notebook?

#### 4. Follow-up discussion and exit ticket (10 minutes)

- Connect information from the lab notebook to scholarly communication and other steps in the research process.
  - How can the lab notebook be used outside the lab?
- As an optional exit ticket, ask students how long they were doing the “Recreating an Experiment” or Kahoot quiz activities to illustrate the importance of writing down information as you conduct research activities.

## CHEF'S NOTE

This recipe can be adapted for a higher-level learning audience by incorporating SLOs, such as evaluating various ELN products and apply-

ing them to various research areas and adjusting the introduction for prior experience with lab notebooks. There are many programs that can be used to create ELNs; some examples that can be adapted to instruction include Google Docs/Drive, Microsoft OneNote or Azure Notebooks, Jupyter Notebooks, and the Open Science Framework (OSF).

Substitutions: Classes that cover programming and code might benefit from advanced features available in ELN products, such as Jupyter

Notebooks and Microsoft Azure Notebooks, which contain data and coding functionality.

### ADDITIONAL RESOURCES

Caprette, D. (n.d.). *Examples of notebook pages*. Retrieved May 29, 2020, from [https://www.ruf.rice.edu/~bioslabs/tools/notebook/notebook\\_examples.html](https://www.ruf.rice.edu/~bioslabs/tools/notebook/notebook_examples.html)

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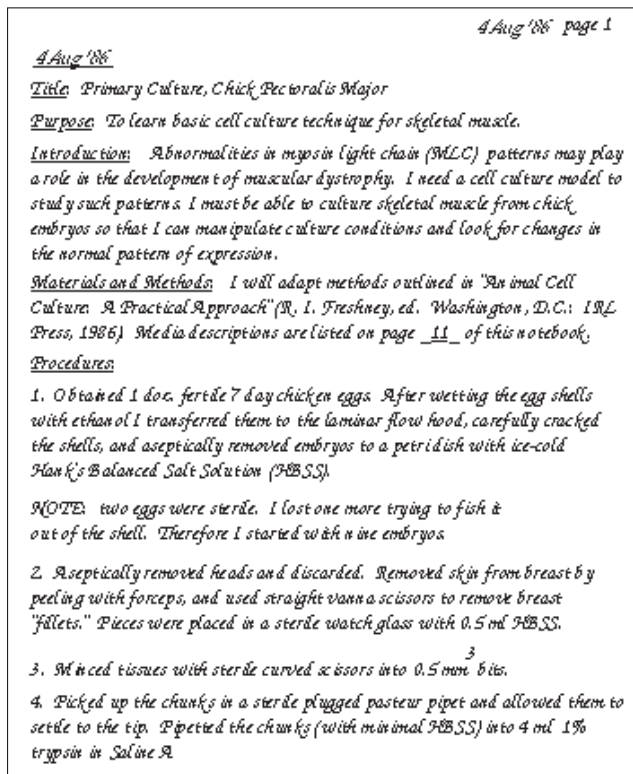
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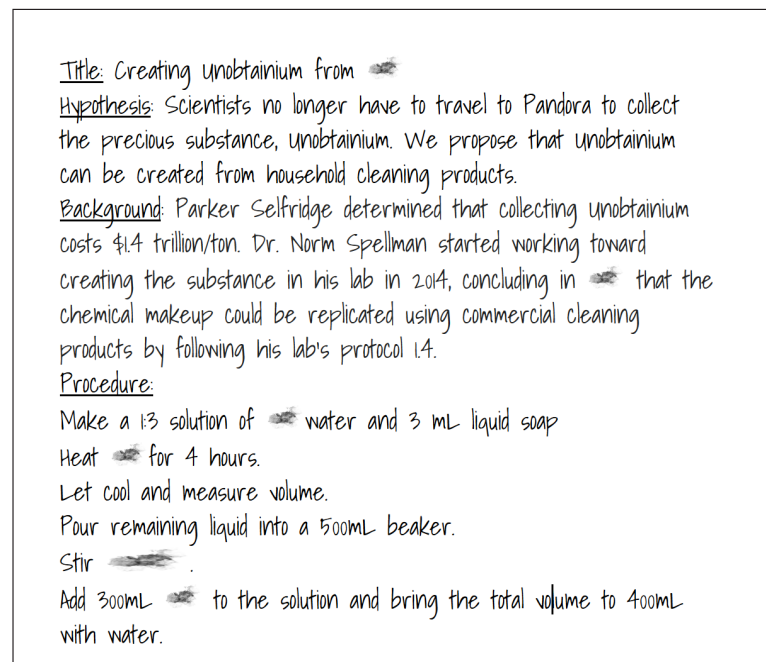
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University of North Carolina Greensboro. (n.d.). Lab Notebook Scenario/Group Activity: Recreating an Experiment. <http://go.uncg.edu/elnsenario>



**Figure 2. Example procedures**

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**Figure 3. Handout for Example Experiment Scenario**

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