Using Drawings to Compare Groupmates' Experiences in an Introductory Physics Lab

Charlotte Dries, Gabriella Khazal, Tiffany Snow, and W. Brian Lane
Department of Physics, University of North Florida

INSTRUCTIONAL LABS AS COMMUNITIES OF PRACTICE

Instructional labs are an important component of undergraduate STEM education. With instructional labs taking up a significant place in the first year of undergraduate study, they impact student persistence and STEM identity[1-3]. These labs not only develop students' conceptual learning, but they also **enculturate students into STEM as a community-oriented profession** based on cooperative work around shared resources[4-5]. An instructional lab can be thought of as a **Community of Practice (COP)**[6], defined as a group of **members** pursuing a common set of **goals** by using conventional **practices**.

A SURVEY OF COP MODELS

Our group's prior work has demonstrated that students can develop different perspectives of a COP[7-8], which we describe as a mental model[9] of the Community of Practice, or **COP model**. A student's COP model includes the following features:

1. The members of the COP and the institutional structures relevant to the COP.
2. The student's understanding of the COP's goals and practices.
3. The student's sense of membership (central or peripheral positioning) or their sense of fit within the COP.

We have developed a qualitative **drawing-based survey**[10] in which students express their COP model of an instructional lab:

1. Draw a picture that shows your experiences learning in this instructional lab. Feel free to draw multiple scenes to communicate your thoughts, and show what it's like working directly with others and working individually in this instructional lab. In your picture, use labels or descriptions to identify who is there, what they are doing, and why.
2. Look over your picture and add or label the following if they're missing from your picture:
   - ❑ The goals people in your lab are trying to accomplish.
   - ❑ Activities the people in your lab do to reach those goals.
   - ❑ How these activities help accomplish these goals.
   - ❑ How you participate in these activities and goals.
   - ❑ How you feel about these activities and goals.
3. Describe what's in your picture, and give a few examples of events that inspired your picture.

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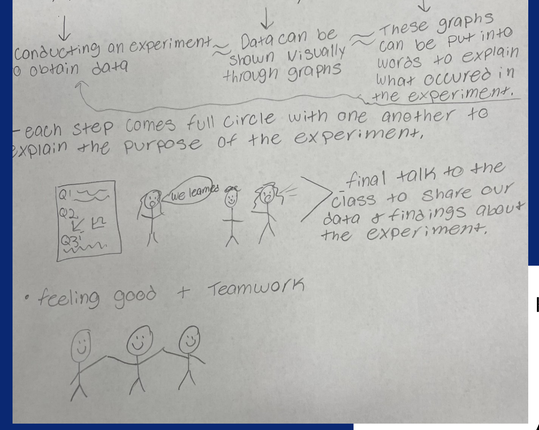
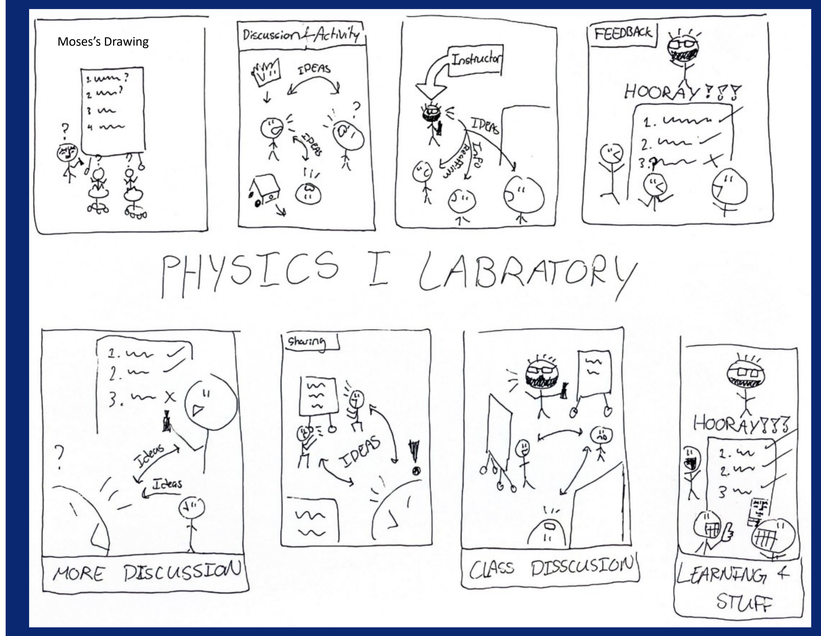
Student-created drawings of experiences within the same lab group show differences in perceptions.





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Lab partners' drawings ↑ | Venn diagram of elements →

STUDY CONTEXT AND METHODS

We administered our drawing survey to students in Introductory Physics for Life Sciences (IPLS), an interactive course centered around lab-based explorations of physics content relevant to life science fields. We cataloged their drawing elements and categorized them as related to the lab's **goals**, **members**, and **practices**.

Here, we present the drawings created by **three lab partners** (pseudonyms Karmen, Moses, and Sarah) who worked in the **same group**. We organize the drawings' elements using a Venn diagram to represent which elements their drawings hold in common, and which their drawings differ on. These elements are color-coded based on the COP framework. We use this data to consider the question, "**To what degree do students with a shared lab experience draw similar representations?**"

DISCUSSION

The Venn diagram shows that, despite the three lab partners having a shared experience, their drawings exhibit comparatively **few elements in common**. Particularly…

- The three drawings **share no goals** in common.
- The common items primarily depict the **physical layout** of the lab.
- The differences primarily consist of the **focus of the learning activities and the students' feelings**.

We conclude that these students drew different expressions of their shared experience, drawing attention to their differing perspectives on the lab.