Investigating Interactions Between Students and TAs/LAs in a Reform-Based Introductory Physics Laboratory

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Background:

- Previous studies have focused on the interactions between students and instructors. Research on interactions inside of reform-based IPL²S is uncommon.
- Even with intensive ongoing training, interactions between students and instructors vary significantly from one instructor to another[2].
- Most interactions between students and instructors are initiated by the instructors during a physics tutorial (discussion) section[3].
- Interactions affect student engagement[4].
  - More frequent interactions between students and instructors in a lab can be linked to an increase in student engagement, independent of the length of the interaction.
  - Increased student engagement has an indirect positive correlation with student learning.
- Instructors engage in interactions with students more in reformed labs than in traditional labs[5].

Laboratory Environment:

Lab Setup

- Teaching Assistants (TAs) and Learning Assistants (LAs) were the primary instructors and varied by section.
- A professor ran all sections but was not always present during labs.
- Each lab consisted of 3 days split primarily into planning, data collection, and presentation.

Figure 1. Image of the Lab Classroom

Student Demographics

- Most students were Juniors or Seniors.
- Large population of affiliated-health majors (Pre-Med, Pre-Nursing, Physical Therapy, etc.)

References:

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Research Objectives:

- Explore the types of interactions that occur in the reform-based Introductory Physics for Life Science (IPL²S) Laboratory between students and instructors.
- Investigate how interactions can promote student engagement within the lab.
- Understand how these interactions can relate to students' procedural and conceptual sensemaking[1].

Methodology:

Research Design

A qualitative exploratory study focused on the interactions that occur between students and instructors. Several interactions have been identified for a case study and further investigation.

Data Collection

- Video of computer screen and audio of students was captured by the lab computers. Some students chose to use personal laptops as well as or instead of lab desktops.
- External cameras also captured video and audio of students during the lab.
- Data was collected from 5 sections.
  - For each lab, a section had 0 – 4 groups that were recorded
  - Groups were usually recorded working over 2 lab days

Data Analysis

- Early work coded and analyzed instances of procedural and conceptual sensemaking among student groups[1,]
- Videos were watched to identify moments when students and instructors were interacting.
- Initial code book was created splitting interactions into 3 components, eliminating brief check-ins from analysis.

Code	Definition
Prompt	What causes students or instructors to engage with one another (also called 'initiation' in literature.)
Action	How students and instructors engage with one another to work towards sensemaking.
Result	What happens after participants disengage.

- Code book was further refined to account for procedural and conceptual interactions while not focusing on interactions that were neither procedural or conceptual (e.g., discussing course logistics).

Code	Definition
Procedural Interaction	Students and instructors engage about methods and processes used to complete the lab.
Conceptual Interaction	Students and instructors engage about scientific ideas related to their experiment.

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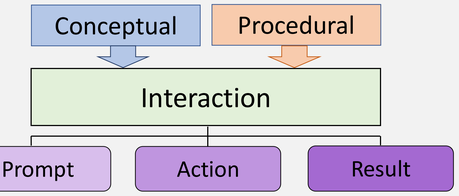

Figure 2. Types and components of interactions with Examples

Preliminary Results:

Conceptual- vs Procedural-based

- Students engage in more Conceptual-based interactions with TAs or lab professors, and more Procedural-based interactions with LAs.
- Procedural-based interactions occur at higher rates but for shorter durations than Conceptual-based interactions.

Interaction-base switching

- Interaction components can switch between Procedural-based and Conceptual-based.
  - Instructors seem to be the instigators of this switching between the prompt and action.
    - Possibly because of personal style or because they think that switching will help the students reach the end goal.

Non-interacting Groups

- Some groups have engaged in and completed labs with little to no interactions with instructors.
  - Students may not feel comfortable approaching TAs to initiate an interaction
  - Students may have understood the lab enough to not need help

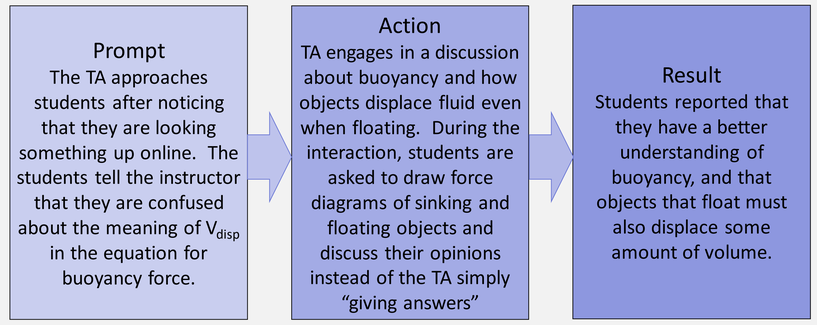

Figure 3. Flowchart of conceptual interaction

Next Steps:

- Develop a more robust codebook for distinguishing conceptual and procedural interactions.
- Identify a theoretical framework to help analyze why interactions switch between procedural- and conceptual-bases.
- Perform an in-depth case study of procedural and conceptual interactions including base-switching.