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### Metacognitive Prompting to Foster Evaluating Skills for Biochemistry Students

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## Introduction

- Greater control in personal thinking can lead to improved student problem solving<sup>1</sup>
- Metacognitive training can improve students' understanding of their own knowledge<sup>2</sup>
- Biochemistry students' metacognition has not been focused on in previous studies
- We tested and evaluated how metacognitive prompting can impact students' ability to use metacognition.

## Research Questions

- How do undergraduate biochemistry students employ metacognitive skills and metacognitive knowledge when solving buffer problems?
- In what ways does implicitly targeting metacognition change a biochemistry student's metacognitive approach to solving buffer problems?



Fig. 1: Livescribe example from participant 17

## Discussion

- The relationship between students' metacognition and their performance on buffer problems: Students who performed well and students who performed poorly had a similar level of metacognition. However, students that scored in the middle demonstrated the most metacognition. This is representative of the possible relationship of metacognition and the **zone of proximal development**<sup>7</sup>.
- Our study was small scale and could benefit from having the methods of this study implemented into the entirety of a semester to see a long-lasting impact of metacognitive prompting.

## Methods

- 25 student interviews using a think-aloud protocol and Livescribe documentation<sup>3</sup> (fig. 1)
- Students answered two buffer problems, a concept that is difficult for many biochemistry students.
- Metacognitive prompting asked students to think about other "students who get this question wrong because they do not carefully reflect on what the question is asking or are misguided by their intuition" (ref 4, p. 1807)
- Zohar and Dori framework<sup>5</sup> (fig. 2) was used for our qualitative codebook thematic analysis<sup>6</sup>
- Metacognitive knowledge is knowing one's own knowledge. Metacognitive skills is the regulation of that knowledge.

The implicit metacognitive prompts (that asked students about an unreflective student) influenced students to be more metacognitive. In particular, the skill of evaluating.

## Results

- All 25 students showed metacognition in their interviews
- 20 of the 25 students had increased metacognition between Q1 and Q2
- Largest increase between questions was evaluating. In Fig. 3, the gray upwards flow displays the increase in evaluating
- Planning decreased, likely due to subconscious planning while thinking about the "other" student

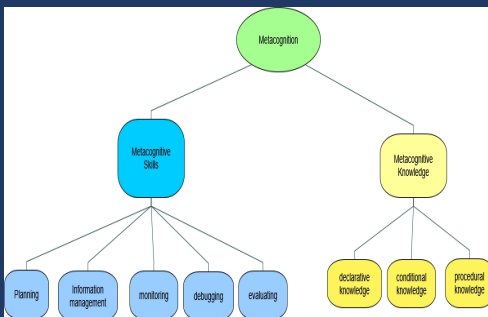


Fig. 2 Metacognitive Framework<sup>5</sup>

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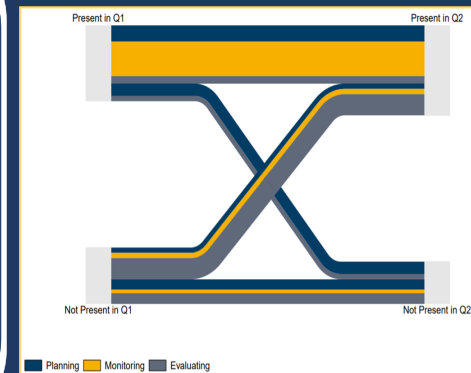


Fig. 3: Changes in presence of Metacognitive Skill Types