Investigating the Effects of Voice Self-explanations in Flipped Classrooms

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Introduction

Motivation

- Generating explanations for oneself can encourage self-regulation, engagement, and retention when learning new content [3].
- Previous studies have looked at using audio and video as mediums for explanations to capture different forms of expression and increase cognitive presence [9, 2, 6].
- It is unclear if the medium used for explanation impacts conceptual retention.
- A preliminary study conducted at the University of Toronto suggests that some students prefer using voice input for open-ended answers [1].

Our goals:

1. Examine the impact of the medium used for explanation on *student performance*.
2. Observe *student preferences* for mediums to generate explanations.

Background

- **Definition of self-explanation:** generating explanations for *oneself* in an attempt to *make sense* of new information [4].
- Encourage students to express their thoughts in a *structured* and *focused* manner [5, 7].
- Provide opportunities to notice conflicts and resolve them when *new information* conflicts with *prior-knowledge* [3].
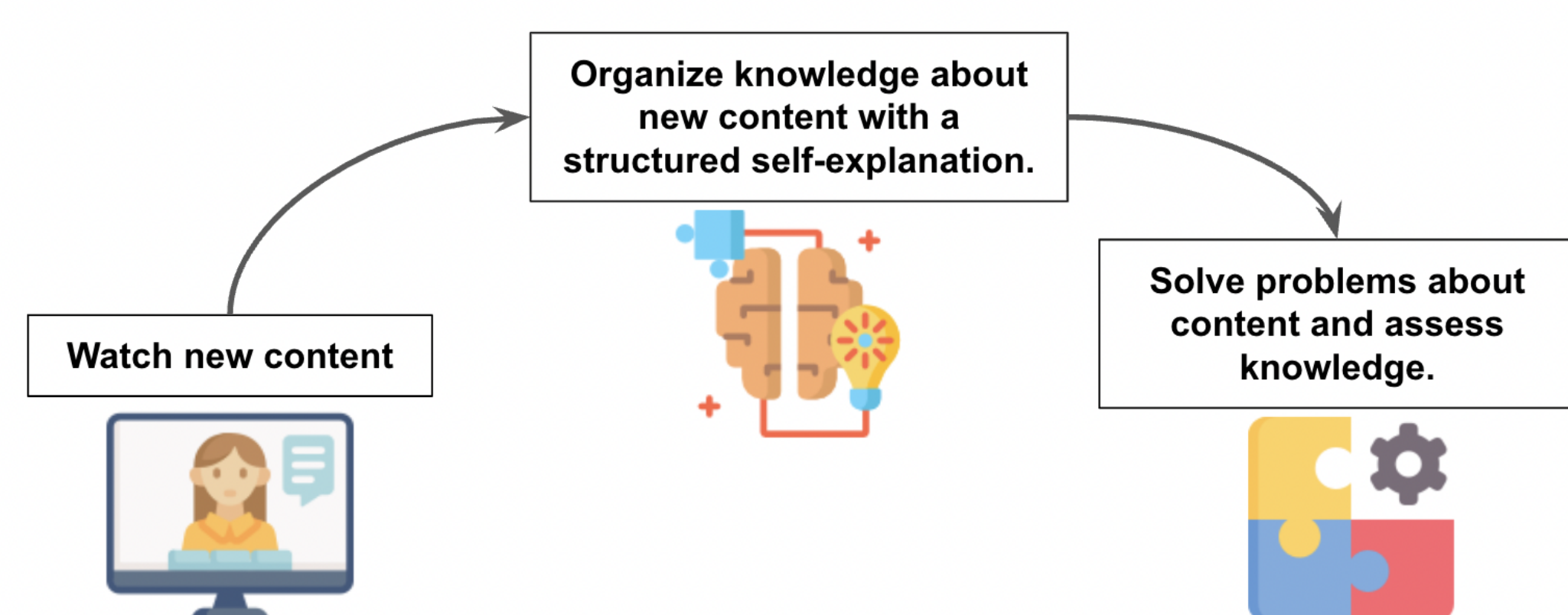

Figure 1: Self-explanation in our context.

- Prior work in a databases course indicates that students who are prompted to self-explain on a topic perform better immediately [8].
- A lot of students are resistant to self-explain, and those who don't do so appear to perform poorly on subsequent assessments.
- A previous survey done at UofT suggested that some students prefer using voice responses for open text responses [1].

Methods

- 247 students in an Introduction to Databases course at the University of Toronto were divided into 3 groups: Voice (n = 83), Text (n = 81), and Optional (n = 83).
- Depending on the group assigned, students were asked to either self-explain by voice, text, or given the option to choose between the two mediums after watching videos in the preparatory component of the course on the learning management system. (see Figure 2)
- Students were asked to answer multiple choice and SQL questions *immediately* after they reflected on a topic, and then after a week (*check-in*).
- For the last video of the course (week 9), everyone was assigned to the optional condition to measure students choices when giving them the option to select their medium of self-explaining
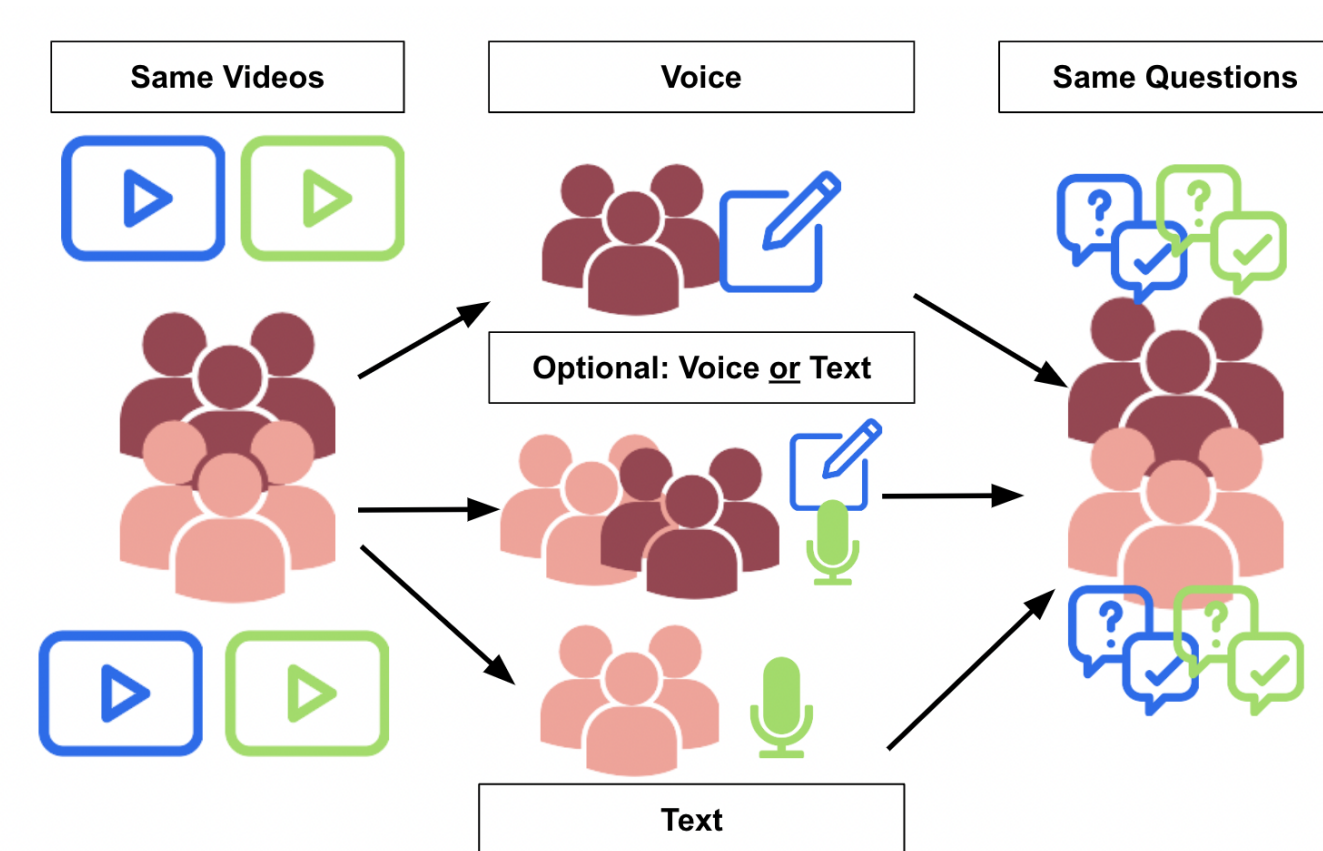

Figure 2: Treatment group division for reflection medium

Results

- While we did not find significant evidence in immediate or check-in question grades between medium of explanation, we found that students explaining by voice and text tend to make fewer submissions than students who got a choice of medium.
- We noticed that students in the text treatment group had the highest response rates throughout the course. Students in the voice condition had the lowest response rates, which may indicate that students are hesitant to self-explain with a voice medium (Figure 3)
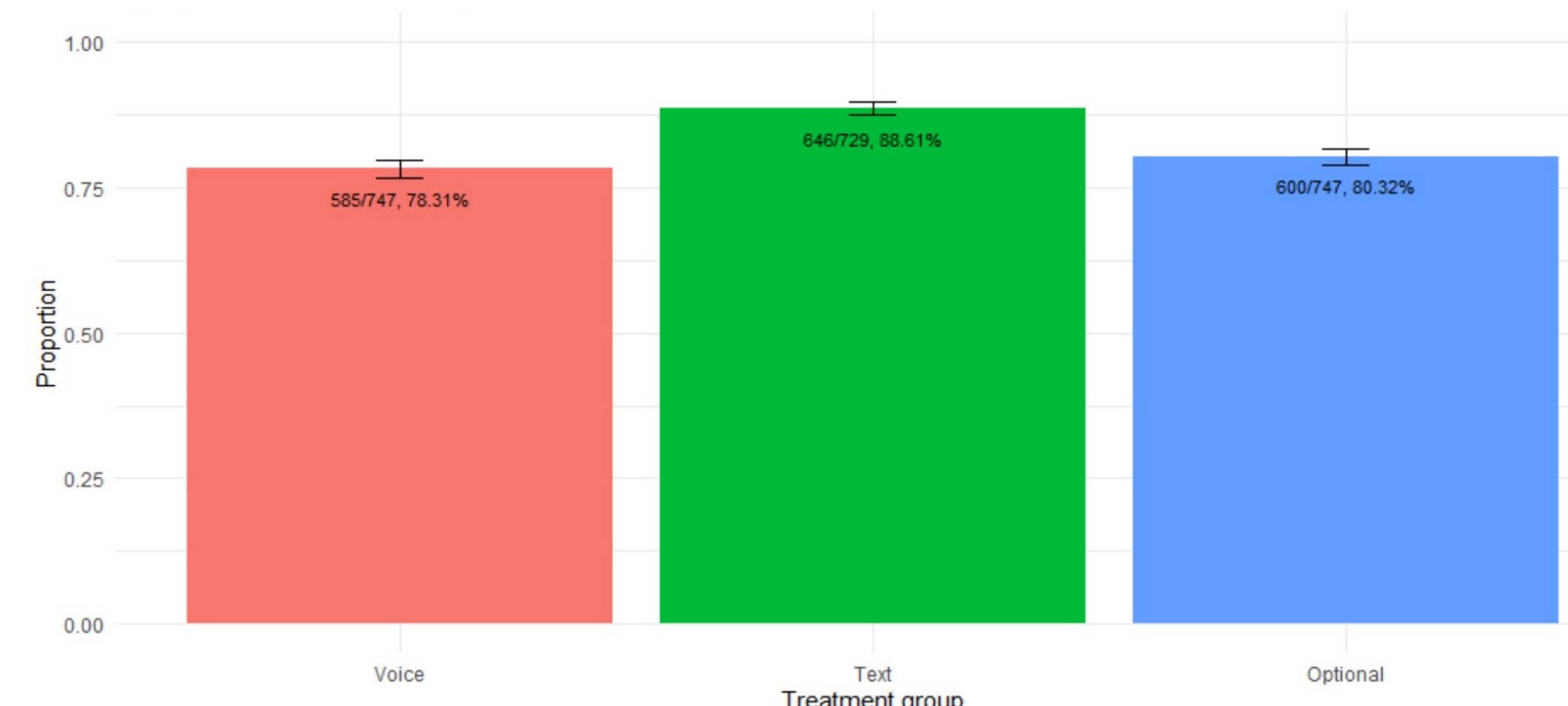

Figure 3: Reflection response rates across treatment groups

- In Week 9, 44% of the students in the voice treatment group chose to use text as their medium to reflect (Figure 4). On the other hand, only 3% of the students in the text treatment group chose to use voice as their medium to reflect (Figure 5).
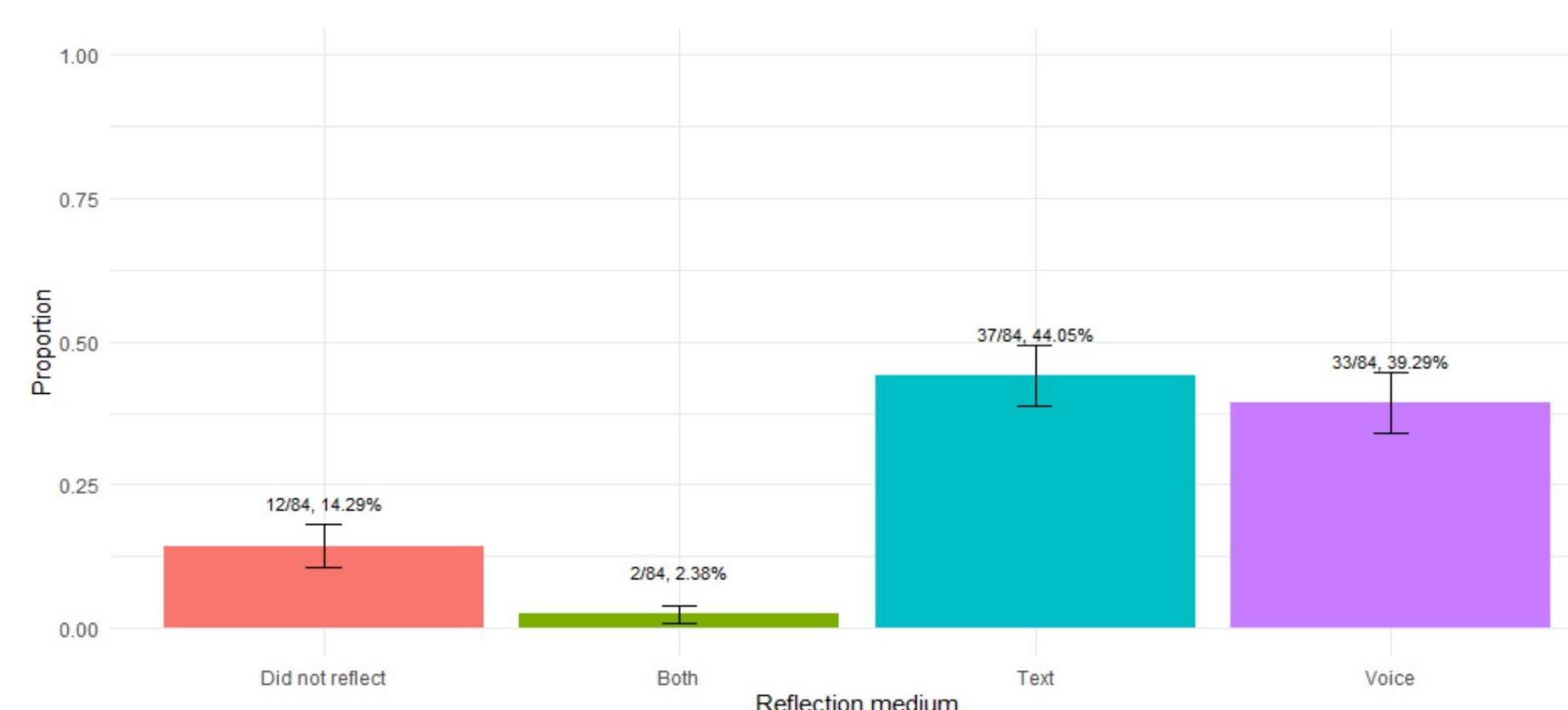

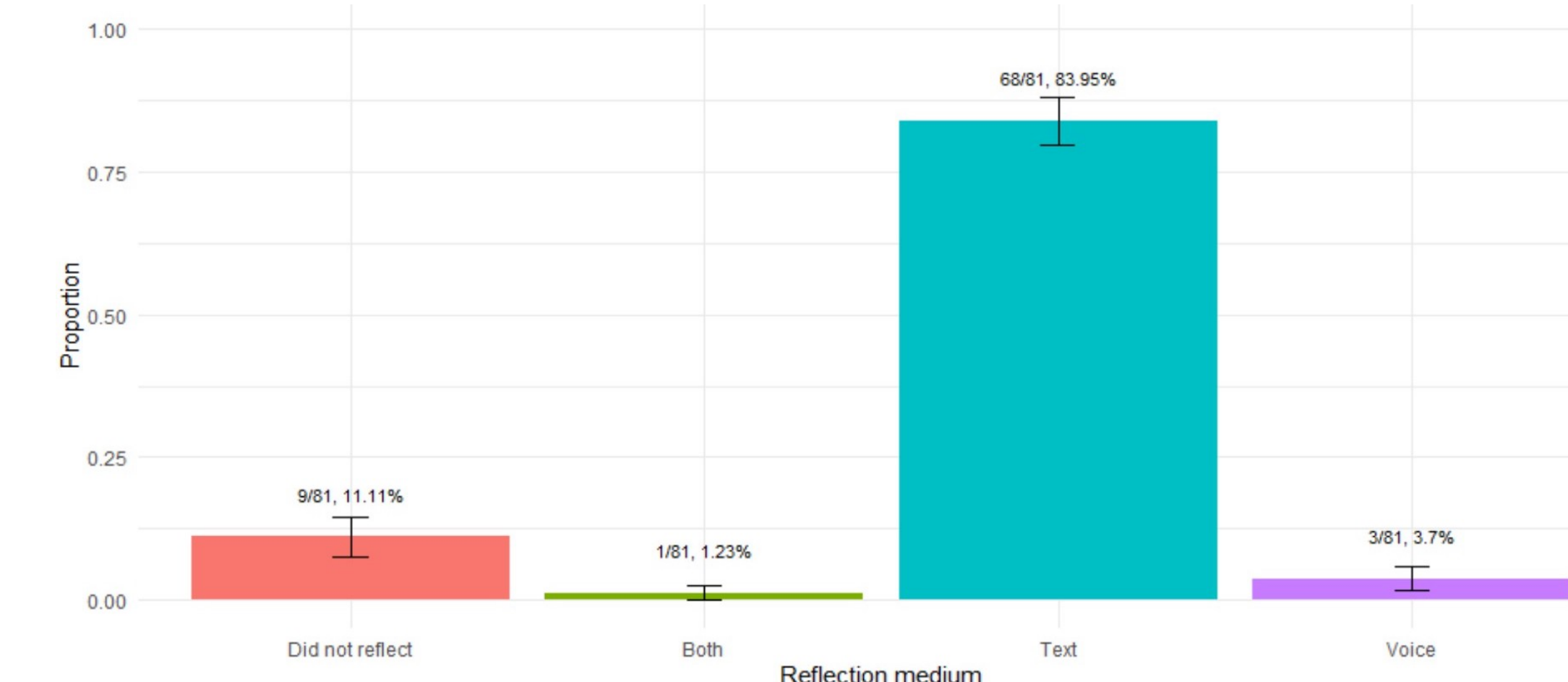**Figure 4:** Reflection medium choices in Week 9 by students in the Voice Treatment Group.

Figure 5: Reflection medium choices in Week 9 by students in the Text Treatment Group.

- According to Figure 6, most students seemed to prefer having both voice and text input as options to self-explain. While voice generally was not preferred as the only option, we also noticed that people in the voice condition slightly did not prefer having text input as the only option either. This may indicate that once students have used voice input, they may find it useful sometimes.
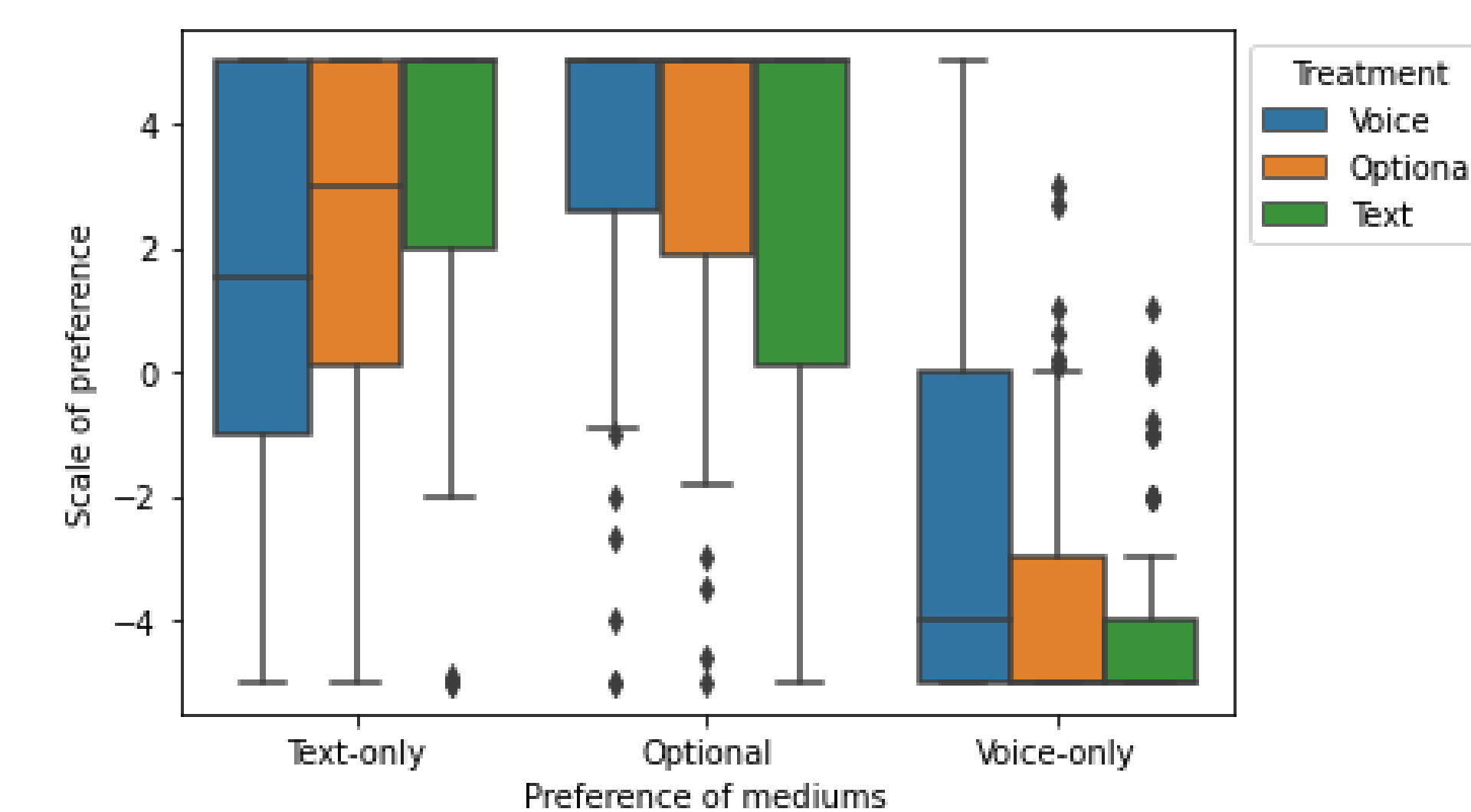

Figure 6: Student preferences in mediums for reflection, according to end-of-term survey (-5 strongly disagree to +5 strongly agree).

Future Work

- Look at student self-explanations qualitatively to assess if student submissions are actually self-explanations and not just elaborations/summaries.
- Look into whether students explain differently on seeing a sample explanation from their instructor or another student. Do student preferences for mediums change on seeing examples?
- Allow students to choose a medium to explain early on, and see if trying a different medium influences their choice over the period of the course.

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