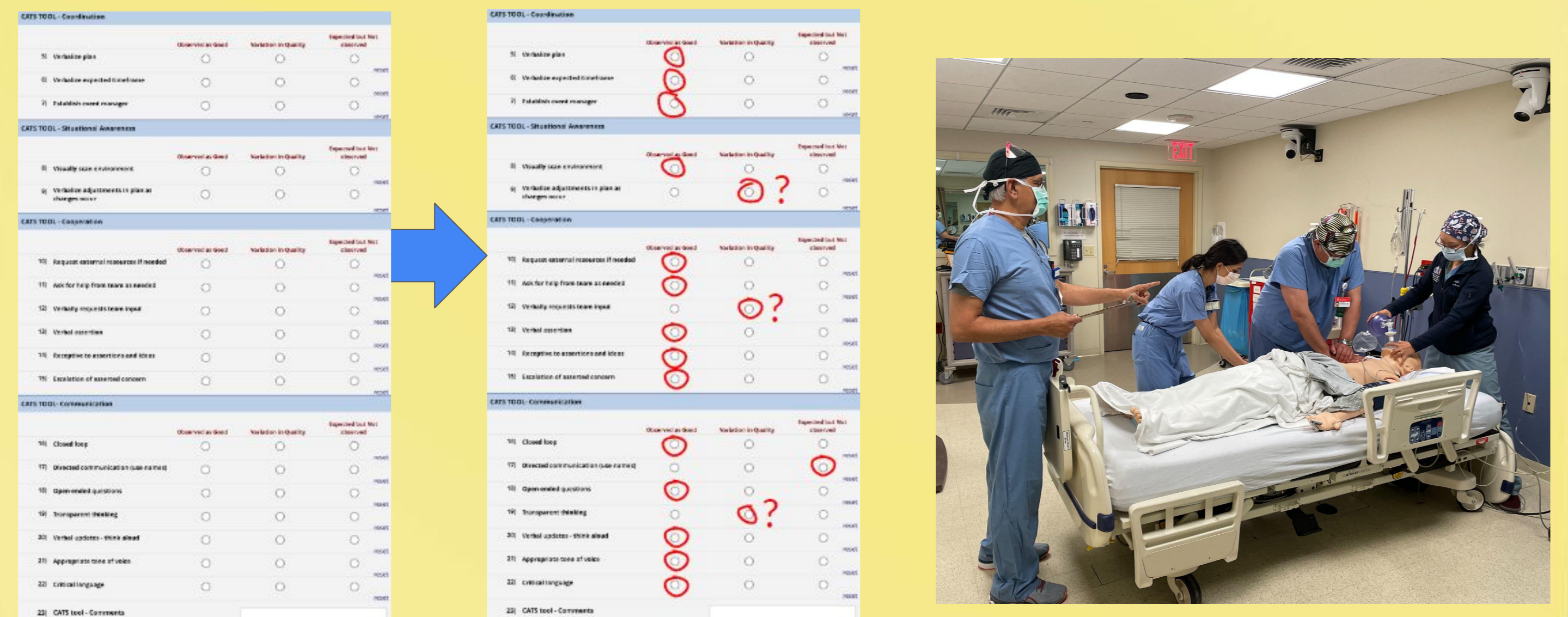


A Digital Clipboard for Real-Time Observations and Multimodal Annotations of Team Performance

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Introduction and Motivation

Goal: real-time observations complete with evidence



In hospitals, there are people who observe perioperative teams to evaluate their performance by completing survey-based observational tools.

The Likert-scale ratings of this tool can't provide context or evidence for why ratings were given. Thus it can be hard for the evaluated team to fully understand the ratings and how to improve.

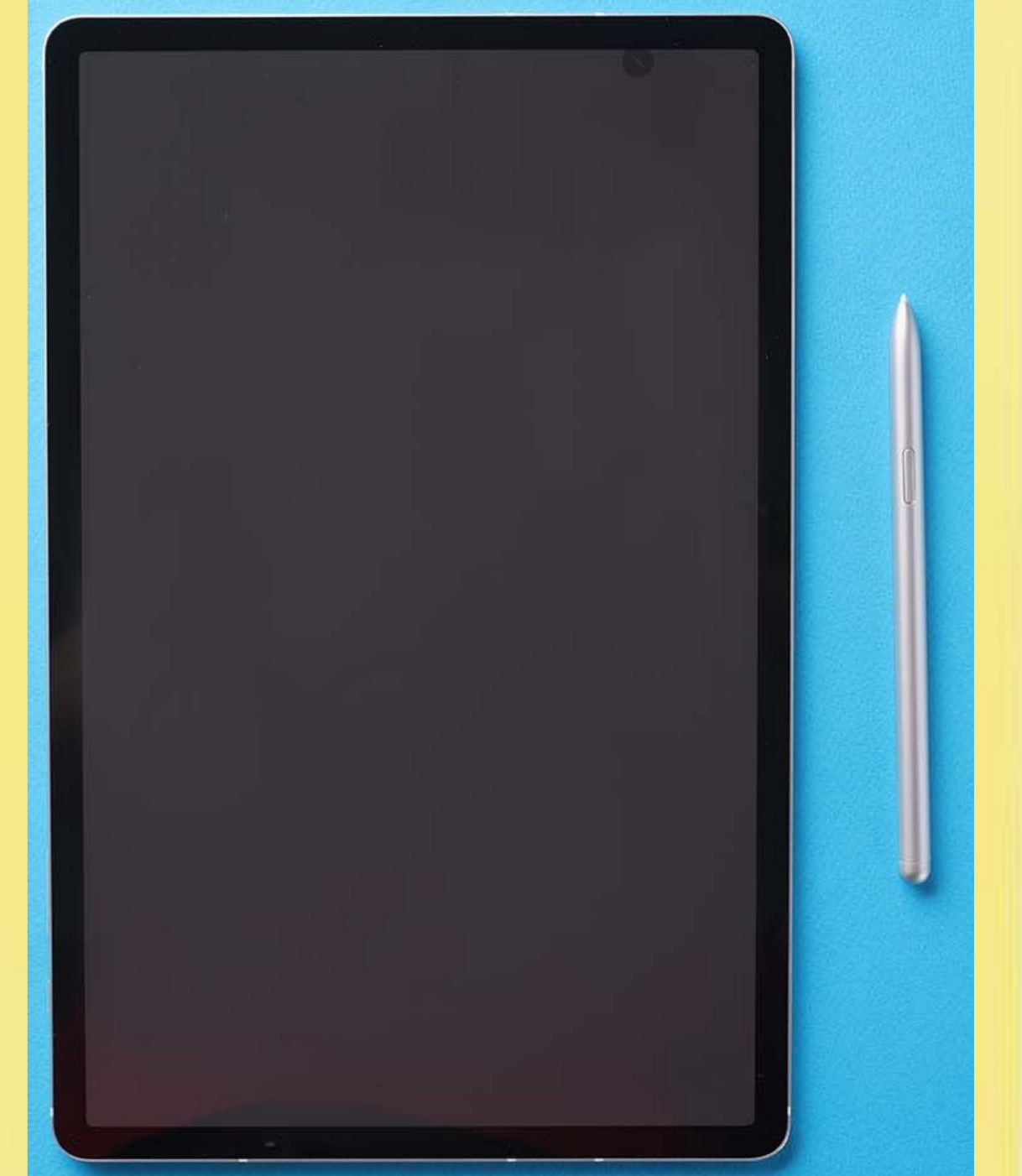
With clipboards, observers can write extra notes in the margins or even right next to the questions they are related to. Unfortunately, it can still be hard to describe the context/evidence. Furthermore the operation won't pause for the observer to write.

Requirements

- Add to existing evaluation standard
- Handheld and usable while standing
- Accessible
- Comfortable to use for 5 min to 60 min
- When the session ends, so does the observer's job; no extra time needed

These requirements suggest tablets, but...

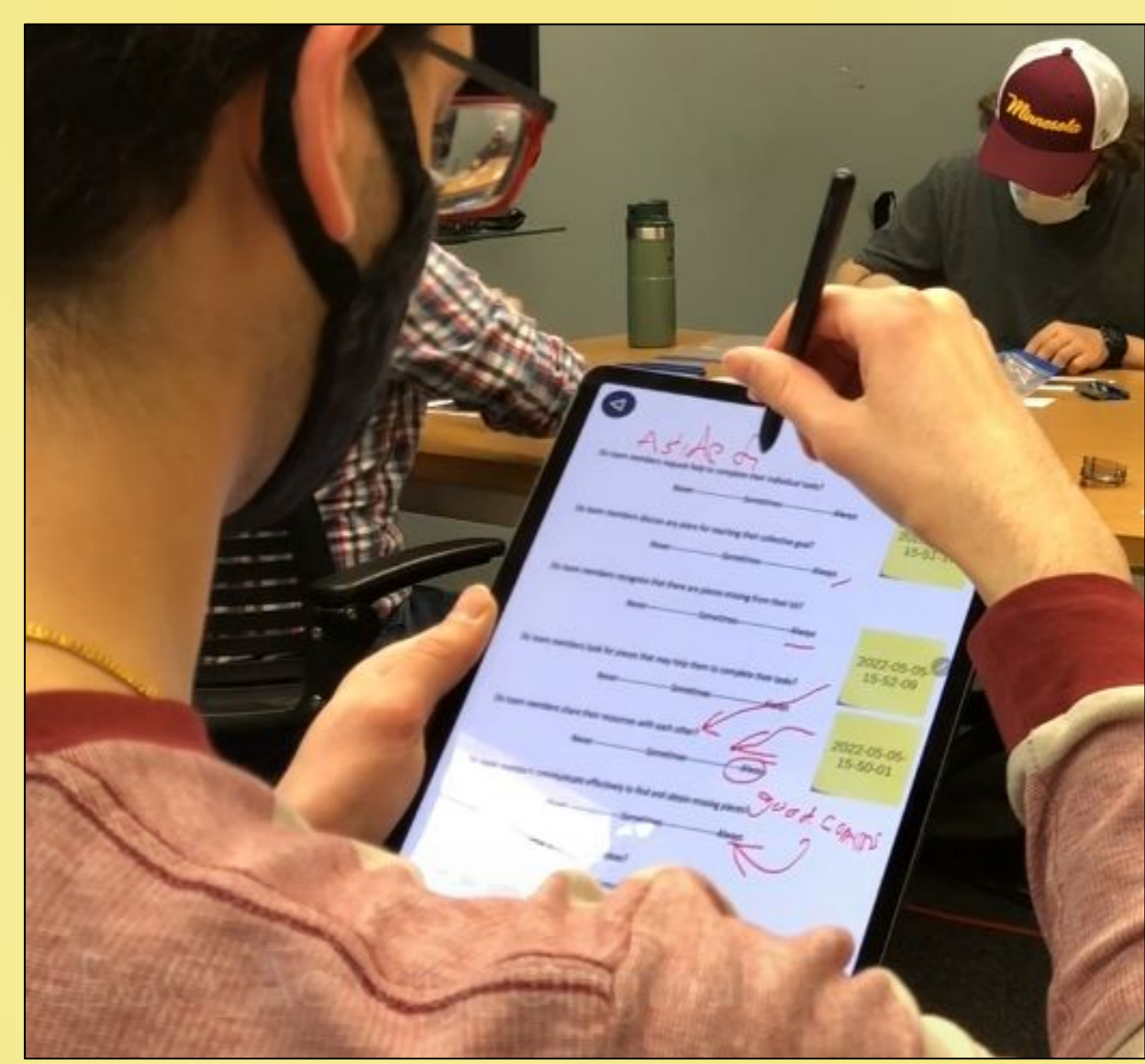
- Tablets are not optimized to make use of a hand holding the tablet
- Notetaker and pdf editors don't completely leverage the multi-modal data collection options



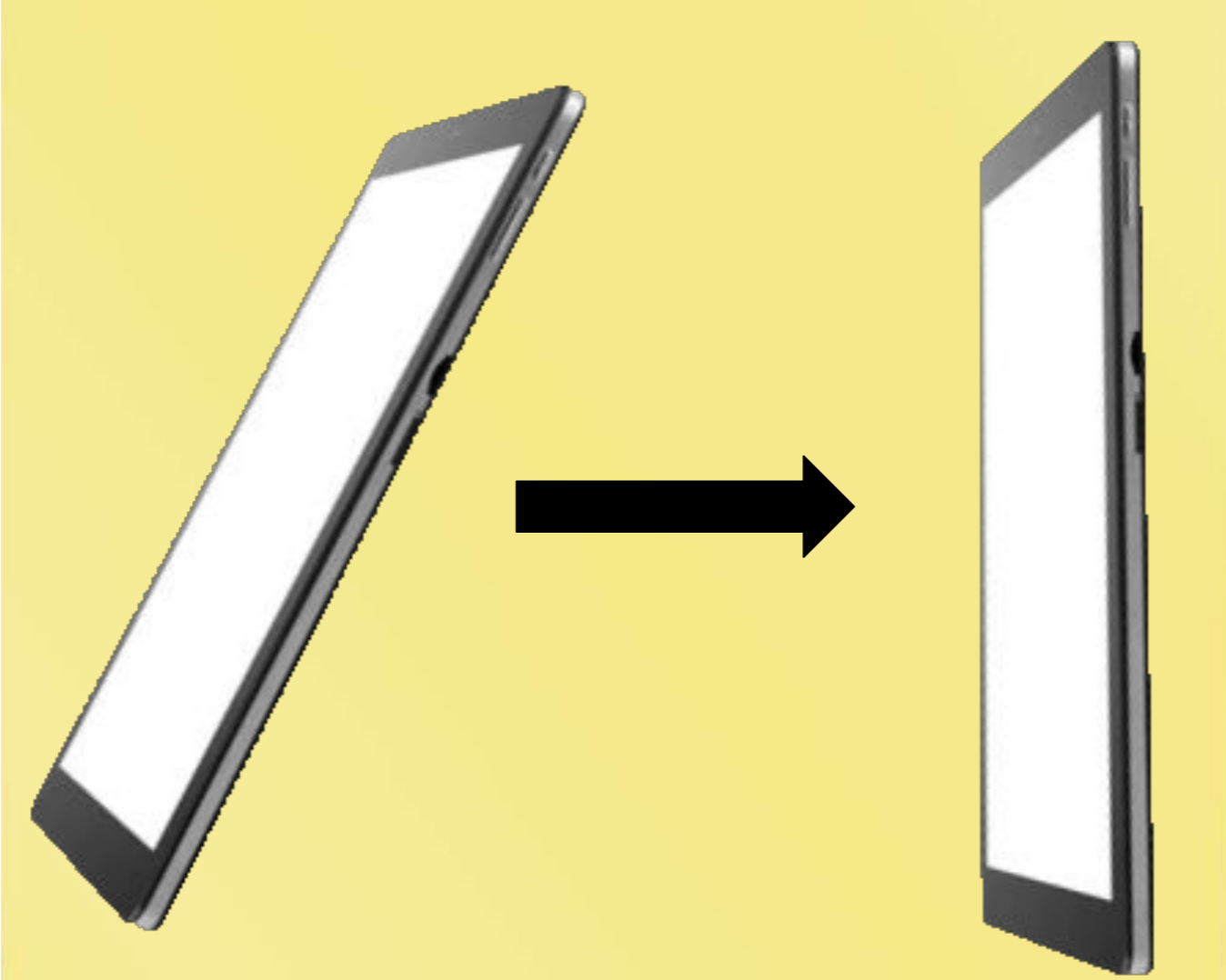
Enter the Digital Clipboard

We created a prototype tablet application to act as a "Digital Clipboard". With this application, an observer can write on an observation tool as if it were on paper and record videos which can also be annotated.

Digital Clipboard Prototype



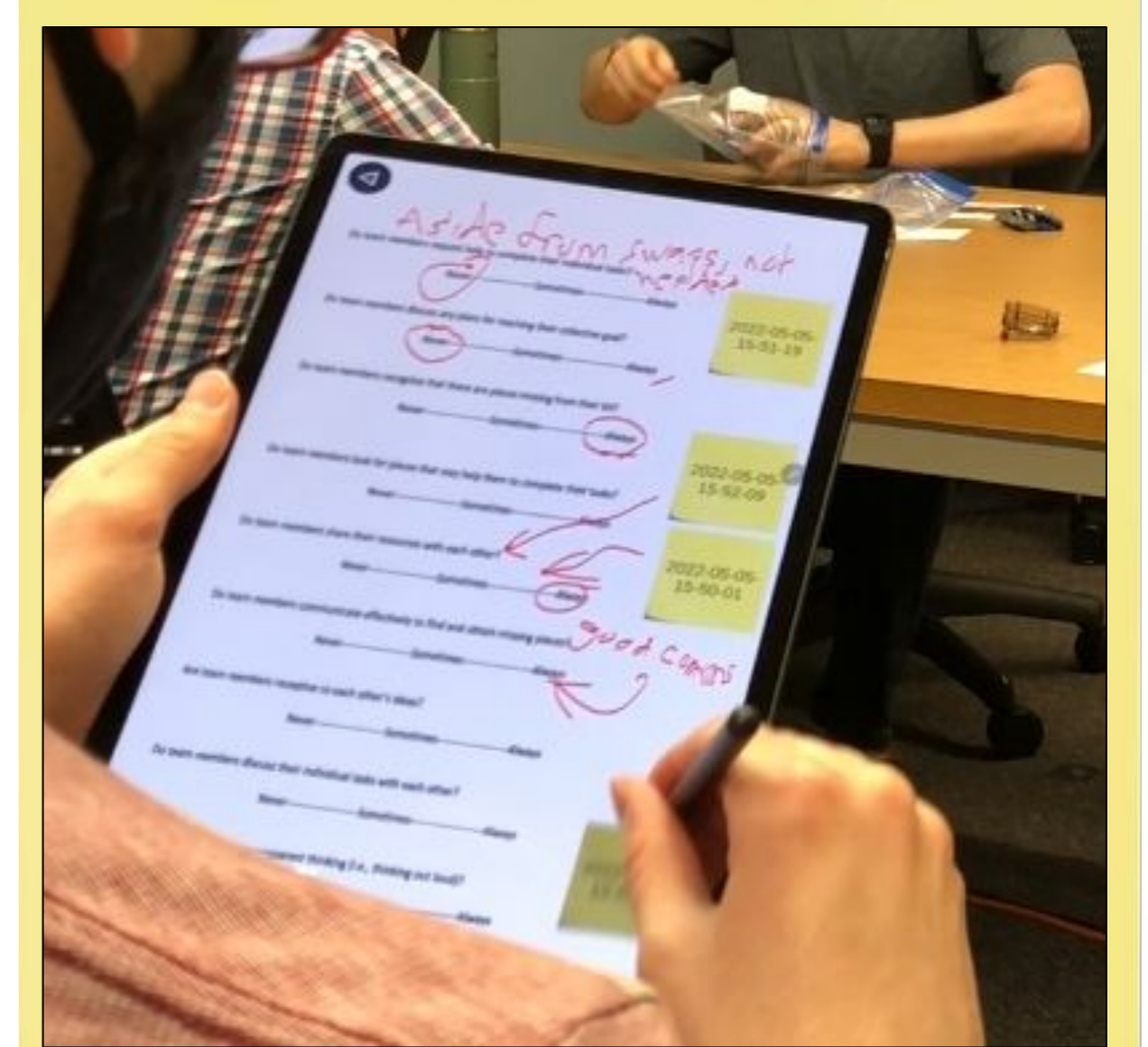
Write directly onto the observational tool. Answer questions and give details for a question rating.



Seamlessly change from observational tool editing to video recording by tilting the tablet.



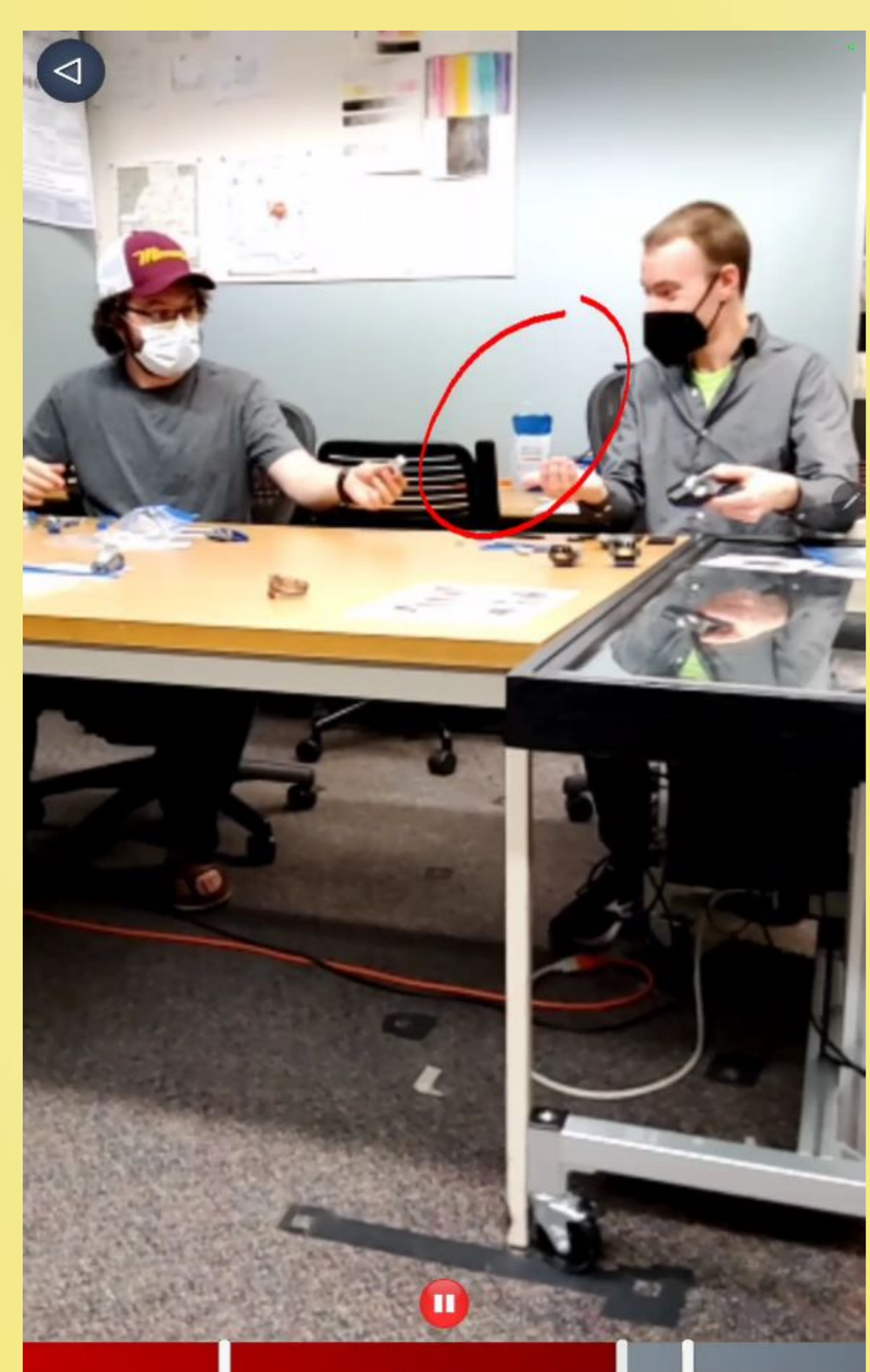
Annotate the video while recording it, just like the observational tool. Focus attention to parts of the scene and/or write words to aide in the visual analysis.



Tilt the tablet back down to a comfortable writing angle to save the video and create a "video post-it-note" on the page. Drag the post-it wherever you want it.

Evaluation via a Collaborative Building Block Task

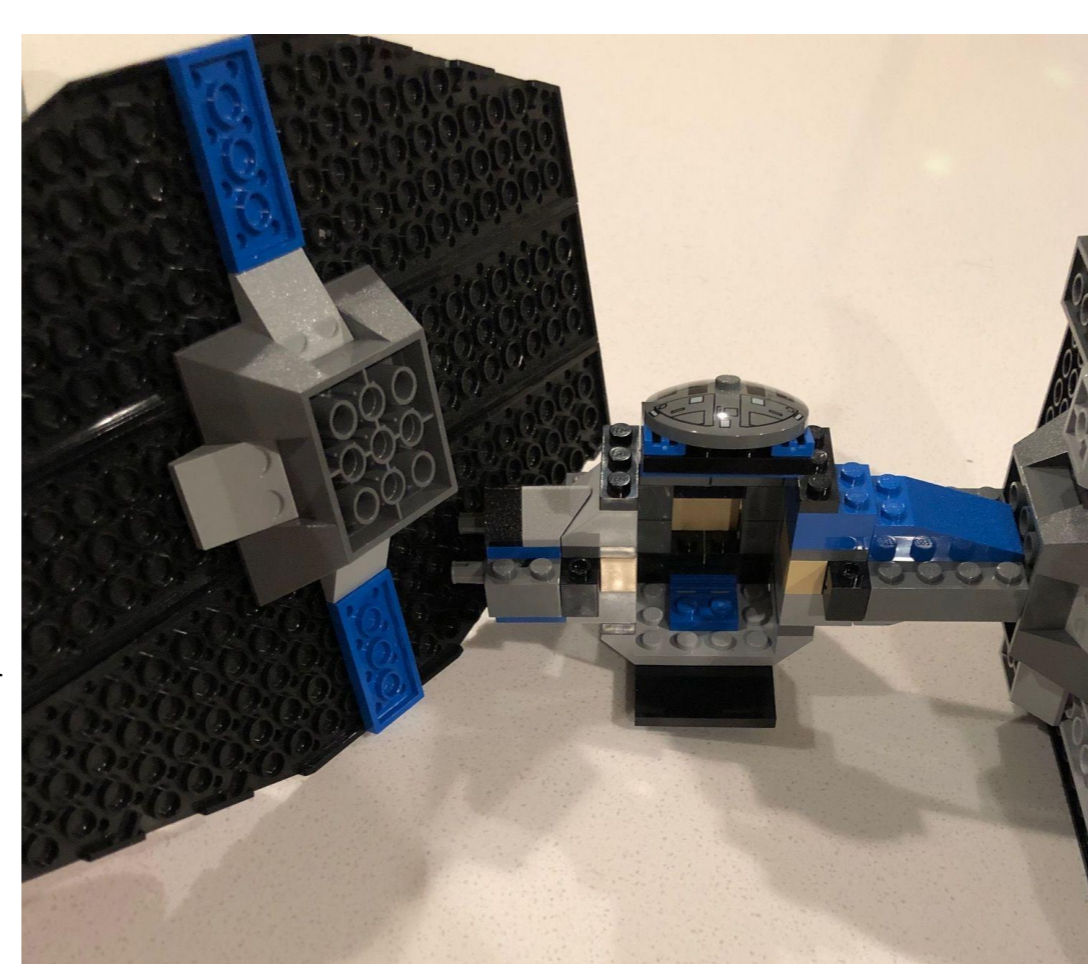
Additional Functions via Pen + Limited Touch



To test the Digital Clipboard, we had lab-mates create a simple structure out of blocks in a collaborative fashion and used the application to evaluate their performance. We modified a typical observational tool to fit the task. The row of pictures above and the picture to the left are from this activity.

Our observations from the activity:

- Easy to swap between the observational tool and the video recorder
- Making annotations is easy and intuitive
- Hard to hold the tablet steady with one hand in video recording mode
- Videos need to be taken preemptively to some degree lest you miss the event



- Tap a post-it to watch a recording
- Tap the timeline at the bottom to go to that point in the video
 - Marks on the timeline show when annotations were made
 - Annotations appear on screen 2 seconds before their creation timestamp
 - Events motivating annotations occur before the user starts making the annotation
 - These annotations can focus the observer's attention to vital details to aide in the visual analysis

References

1. Pfeuffer, Ken, et al. "Thumb+ Pen Interaction on Tablets." *CHI*. 2017.
2. Zhang, Yang, et al. "Sensing posture-aware pen+ touch interaction on tablets." *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. 2019.

Conclusion

- Our prototype tablet application seeks to improve the effectiveness of evaluation of perioperative teams
- We can leverage multiple tablet inputs simultaneously for a more seamless experience

The observer must use one hand to hold the tablet; therefore they have limited reach with one hand's fingers (limited touch). We identified two holding styles as shown in the two images above and to the right: (a) non-dominant hand thumb up and (b) arm around the back. We believe it is reasonable for an observer to swap between holding styles. With all this in mind, we created the above finger menu mockup where 4 buttons appear near the bezel on either side by tapping near said bezel.

Informal Naturalistic Survey

We wanted to see how people hold and interact with tablets given they must use one hand to hold it. We had volunteers write something in both portrait and landscape orientations and play around with the finger menu mockup.

Results

- 4 of 12 volunteers held the tablet from the bottom instead of using either holding styles
- Some avoided touching the screen except with the pen
- Subtle differences in how far the volunteers' fingers were extended
- 7 of the 9 volunteers who used the finger menu mockup did so as shown in (a) of the previous picture as opposed to (b)

