Discourse Moves for Unit 5: Investigating Sampling Distributions

Before beginning the conversation, clarify what different elements of the display of the sampling distribution represent.

1. "What does each case value here mean? Tthe proportion or percent red in a sample of 10, 100, 1000) __% red is how many red outcomes for (10, 100, 1000)?"
2. "How many different samples are represented here?" (Should be at least 300 samples, be certain that students distinguish between sample size and number of samples)

Eliciting a strategy/hypothesis:

*Ask a student to make a conjecture about something they notice about the larger sampling distribution.*

Box 1: Interpreting the sampling distribution   *Box 2: Explaining stability and change in statistics*

"What do you see happening as the sample size increases?"   "What does the median of these 300 samples of (10, 100, or 1000 spins) tell us?"   "What does the IQR of these 300 samples of (10, 100, or 1000) tell us?"
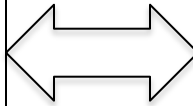
"How do the displays show us that?"   "Why is the shape of the sampling distribution like this?"   "Why is the median of the sampling distribution not changing?"   "Why is the IQR changing?"

Building Collective Understanding:

1. Restate that student's hypothesis or have someone else restate the hypothesis to make the hypothesis public (yes-anding/making it public)
   - "So you notice that _____ ?"
   - " _____ claims that the trend is _____."
   - "_____, can you restate that in your own words? Why does _____ think the median is not changing but the IQR is changing"

2. Ask any extension/clarification questions if necessary to help others understand.

   - "What do you mean when you say _____ ?"
   - " _____, can you come point to where you think he sees that in the sampling distribution?"
   - "_____, what about this display shows you that?"
   - "I'm not sure I understand what you mean by _____."

Eliciting a response to the hypothesis:
Ask other students to respond to the hypothesis, making sure they clearly explain or show their reasons for agreement/disagreement.

- "_____ is that something you agree with? Why?"
- "Do you agree with _____ that the sampling distribution shows _____?"
- "What do you think about _____'s claim that _____?"
- "Who can respond to _____? She thinks that as the sample size increases, _____."
- "Can someone else help us understand why _____ is happening?"

Connective statements/questions (What stays the same/what changes?):
Ask questions or make comments to get students to think about the similarities/differences between sampling distributions with larger and smaller sample sizes.

- "What changes about the sampling distribution as the sample size gets larger? How did you notice? Why do you think this changes?"
- "Let's look at this outlier with 10 spins (point to 0 or 10% red). How many samples were like this with a sample size of 10? Why didn't we see any of these when the sample size was 100 or 1000?"
- "What might be the advantage of larger samples for trying to guess what percentage of a spinner is blue?"
- "What would happen if the spinner were 30% red instead of 50% red? Predict the medians of the sampling distributions for 10, 100, and 1000 spins. The IQR's?"

Pulling it together:
Make a brief summary statement with a "big idea" that students have come to through discussion. Think of it as a restatement, but you may want to add something extra to help make this idea salient.

- "So we agree that we have to keep in mind that every case in the sampling distribution represents a statistic for one sample."
- "I think the point we're agreeing on is that the shape of the distributions is similar but that the larger samples had more sample statistics concentrated in the 50% red neighborhood. That concentration shrank the IQR's but left the median unchanged."
- "Someone said that the reason 10% red happened with a sample size of 10 but not with a sample size of 100 was because with a 50-50 spinner, only 1 red out of 10 wasn't very likely. But now for 100 spins, that unlikely event has to happen 9 more times! That is even more unlikely, so we did not see it in any of our 300 samples of size 100. Talk with your elbow partner and see if this makes sense to both of you."
- "Let's think more about this next time. Think about how you might want to structure a spinner and the sample sizes that you will use to conduct your own investigation."