REASONING ABSTRACTLY AND QUANTITATIVELY: DICE TOSS

GERRIE KINCAID: Today, ladies and gentlemen, we're going to do an experiment that requires dice. We're going to roll two dice together. And what you're going to be looking for are sums. For example, if I rolled these numbers of dots, could you...

LINDA GOJAK: In this video, we're going to see students reasoning to make predictions about the sums that result when they roll two dice. And they have a conversation about that, which takes some reasoning. They have to think about what the possible combinations are. And then they actually justify their predictions by rolling the dice and seeing what happens.

KINCAID: The question is what do you predict will happen based on the information that we have? Let's go to Taylor.

STUDENT: A seven.

KINCAID: And why do you think that?

STUDENT: Because it has the most ways you can make it out of ten... I mean out of six.

KINCAID: With two dice, right? Okay. Candace, what does your group say?

STUDENT: Since seven have the most probability, I think they would show up more.

KINCAID: And what numbers do you think won't occur as frequently?

STUDENT:The 12.

KINCAID: Okay.

STUDENTS: Four.

STUDENT: Seven.

STUDENT 2: Nine.

STUDENT: We found that not that much of these numbers got what we said, but when it kind of went higher, like the six, seven, eight and nine, like the seven, eight and nine, those are kind of the higher numbers and they kind of got the most out of all of them.

KINCAID: Is that what you expected would happen?

STUDENTS: Yes.

KINCAID: Why, Candace, did you expect that would happen?

STUDENT: Because they have the most ways of making that number.

STUDENT: I thought that because... that because a two will show up more... probably more than what would come up for the 12.

KINCAID: Why would you expect a two would show up more than a 12?

STUDENT: Because, like, a one would show up a little bit more than a six. That's what happened in my other times that I rolled, one would show up more. Or a two or something.

KINCAID: So you're thinking about some experience you've had with rolling dice, and you rolled ones more than sixes, is that correct?

STUDENT: Yeah.

GOJAK: What I like about this lesson is that students have a lot of opportunities to analyze their thinking, to analyze their reasoning by different kinds of representations. In this case, they're making a graph of what happens when they roll the dice and they compute the sums. So, how many does a three come up? How many times does a seven come up? It's really important for students to have this opportunity to think about how they're going to represent their abstract reasoning so that they can justify and continue to build on those mathematical ideas.

KINCAID: Talk it over for just a minute. What can you say about the data we've collected as a group?

STUDENT: It's like a rocket on the space... in my book it has it... so

they're like that in the rockets and that big one's got the biggest rocket, and it goes down and up and down.

KINCAID: That's an interesting analogy. Now, what can you say mathematical about this?

STUDENT: That the sevens is more likely to roll because... because on that chart, you can roll sevens because there's more...

GOJAK: One of the things about this lesson, and one of the things about encouraging students to reason abstractly is to think about how we structure a lesson. I really like this one because it has three clear components. The teacher launches the problem, launches the task for the students to consider, and then the kids really have time to explore. They're rolling the dice, they're recording their results, and then they're thinking about what happens. And the third component of the lesson is bringing everybody back together for a summary, so students can really discuss the different ideas that they came up with and work together to draw some mathematical conclusions.

KINCAID: Okay, so, ladies and gentlemen, we used mathematical probability to make predictions. And did many of your predictions come almost true in this experiment?

STUDENTS: Yes.