STRUCTURES USE: PRODUCTS AND SUMS

KATHY DOOLITTLE: And then, multiplication, you have four times four. We've just finished a unit on multiplication, and they had investigated a number of patterns with multiplication problems, and so today I thought it was appropriate for the students to try to investigate a relationship between multiplication and addition. When we've been working with patterns in the past, before we really investigate those numbers, what has been helpful to us to do? We've been able to make models and give examples.

DOOLITTLE: Okay. I'm going to propose that you make a model, and I'm going to show you how I'd make a model of this.

LINDA GOJAK: When we look at Standard for Practice 7, the whole idea of mathematical structure, it's important to realize that structure implies using patterns and making connections between mathematical ideas. This doesn't happen automatically with elementary students. So, therefore, it's really important that kids have opportunities to represent their ideas concretely or pictorially, to help them see those patterns and make those connections. In this lesson, we're going to see kids doing exactly that – using concrete models to start to develop the relationship between addition and multiplication.

DOOLITTLE: Now, here is my number, here is my sum. I'm going to add four... and this is how I want you to do it. Watch what I'm doing. And four more... And then over here, I'm going to multiply four times four. Okay, now, we have something here to look at. Is it easier to see some things, maybe?

STUDENTS: Yes.

DOOLITTLE: Okay, don't tell me anything you see yet. I'm going to give your group a number, I'm going to give your group some grid paper, and I'm going to let you take your number, set your number up like this, okay? So that you can look at it. When you finish setting it up, when you have your number set up, it's on the grid paper, have somebody in your group be your recorder. Write down anything you find out about this number, any

single thing you can find out about the number.

GOJAK: As students have the opportunity to use models and various representations, they start to connect concrete ideas to the abstract conceptual understanding of mathematics. Very important for students to have the opportunity to see and visualize those concrete models. Some students may need them more than others, but it's those initial concrete experiences that lead children to see patterns in mathematics, and therefore start to appreciate the structure of mathematics. The square tiles in this particular lesson help kids to build an understanding from number to what happens when I add a number to itself, to what happens when I multiply a number times itself.

STUDENT: Well, she has shown that two plus two and two times four both equal four.

DOOLITTLE: Okay, they're the same. Okay, do you see a difference in yours and what somebody else has up there?

STUDENT:Yeah.

DOOLITTLE: Yeah? Okay.

STUDENT: Then we go across, right?

DOOLITTLE: Okay, you have ten plus ten here. Now you want ten times ten.

STUDENT: So you go over...

DOOLITTLE: How far?

STUDENT: Ten.

DOOLITTLE: Right – ten.

GOJAK: As teachers, it's important to develop lessons that allow students the opportunity to find mathematical patterns. It's also critical that students have the opportunity to communicate their thinking and share ideas. This can lead from a very fundamental understanding and explanation of the pattern to a rather sophisticated way of writing about and making generalizations.

STUDENT: And right under the sum is four, so, like, two plus two would be four. And then the number... there's a three and then there's a one, which would be four.