

Teaching Practices that Develop Children's Algebraic Thinking Skills

Algebraic Thinking is a "habit of mind that students acquire through instruction that builds regular, sustained opportunities to think about, describe, and justify general relationships in arithmetic, geometry, and so on." (Blanton, 2008)

Teachers should have four important instructional goals when helping children to think algebraically:

- **Represent:** Provide multiple ways for children to systematically represent algebraic situations.
- **Question:** Ask questions that encourage children to think algebraically.
- **Listen:** Listen to and build on children's thinking.
- **Generalize:** Help children develop and justify their own generalizations.
(Blanton, 2008)

QUESTION

Algebraic Thinking is often more about questioning than telling. Asking good questions gives student the opportunity to organize their thinking and build mathematical ideas. When a teacher TELLS a student which representation to use or how to symbolize a mathematical relationship, it lessens the chance for the student to develop his own thinking. Teachers' questions should help students analyze information, build mathematical arguments, and explain their reasoning. Teachers should improve their own questioning strategies to make sure their questions fall into one or more of these categories:

- Questions that ask children to share and explain their ideas (i.e. strategies, representations, conjectures, and reasoning)
- Questions that ask children to compare and contrast their ideas
- Questions that ask children to find and describe conjectures about patterns and relationships
- Questions that ask children to justify their conjectures
- Questions that ask children to develop more sophisticated ways of expressing their mathematical ideas. (Blanton, 2008)

The attached sheet includes samples of "good", generic questions to ask students to develop their algebraic thinking.

Questions to Develop Algebraic Thinking

Questions that ask children to share and explain their ideas (i.e. strategies, representations, conjectures, and reasoning)

- Does anyone have a conjecture (guess, estimate) to share?
- How did you model the problem?
- How did you represent your thinking?
- Why did you use this particular representation? How did it help you find the solution?
- What strategy did you use?
- How did you get your solution?
- What does the n stand for in your relationship?

Questions that ask children to compare and contrast their ideas

- Mary, do you agree with Jack? Why or why not?
- Did anybody get a different answer/solution?
- How are your ideas different?
- Is there a better way to organize the information?
- Would you use a different argument to convince your friends than to convince the teacher? Why or why not?

Questions that ask children to find and describe conjectures about patterns and relationships

- Do you notice anything that always happens?
- Do you notice anything that is always true?
- How would you describe what is going on in general here?
- Can you describe the pattern (relationship) in words?
- Can you describe the pattern (relationship) in symbols?
- How did you arrive at your pattern (relationship)?

Questions that ask children to justify their conjectures

- How do you know your conjecture will always be true?
- How do you know your solution will always work?
- How would you convince your friends?
- How could you convince your parents?

Questions that ask children to develop more sophisticated ways of expressing their mathematical ideas.

- How could you describe this relationship using symbols (letters) instead of words?
- How can we represent this unknown quantity? How can we represent this varying quantity? Is there a letter or symbol we can use to represent it that might be easier than writing out the name of the quantity in words?