NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

Teacher and Student Actions for Effective Mathematics Teaching and Learning

Pose purposeful questions. Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.

What are teachers doing?	What are students doing?
❑ Advancing student understanding by asking questions that build on, but do not take over or funnel, student thinking. ❑ Making certain to ask questions that go beyond gathering information to probing thinking and requiring explanation and justification. ❑ Asking intentional questions that make the mathematics more visible and accessible for student examination and discussion. ❑ Allowing sufficient wait time so that more students can formulate and offer responses.	❑ Expecting to be asked to explain, clarify, and elaborate on their thinking. ❑ Thinking carefully about how to present their responses to questions clearly, without rushing to respond quickly. ❑ Reflecting on and justifying their reasoning, not simply providing answers. ❑ Listening to, commenting on, and questioning the contributions of their classmates.

Use and connect mathematical representations. Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.

What are teachers doing?	What are students doing?
❑ Selecting tasks that allow students to decide which representations to use in making sense of the problems. ❑ Allocating substantial instructional time for students to use, discuss, and make connections among representations. ❑ Introducing forms of representations useful to students. ❑ Asking students to make math drawings or use other visual supports to explain and justify their reasoning. ❑ Focusing students' attention on the structure or essential features of math ideas that appear, regardless of the representation. ❑ Designing ways to elicit and assess students' abilities to use representations meaningfully to solve problems.	❑ Using multiple forms of representations to make sense of and understand mathematics. ❑ Describing and justifying their mathematical understanding and reasoning with drawings, diagrams, and other representations. ❑ Making choices about which forms of representations to use as tools for solving problems. ❑ Sketching diagrams to make sense of problem situations. ❑ Contextualizing mathematical ideas by connecting them to real-world situations. ❑ Considering the advantages or suitability of using various representations when solving problems.

National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all*. Reston, VA: Author.

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