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Learning to represent, representing to learn.

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Summary: This study explores how students learn to create, discuss, and reason with representations to solve problems. A summer school algebra class for seventh and eighth graders provided opportunities for students to create and use representations as problem-solving tools. This case study follows the learning trajectories of three boys. Two of the three boys had been low-achievers in their previous math classes, and one was a high achiever. Analysis of all three boys' written work reveals how their representations became more sophisticated over time. Their small group interactions while problem-solving also show changes in how they communicated and reasoned with representations. For these boys, representation functioned as a learning practice. Through constructing and reasoning with representations, the boys were able to engage in generalizing and justifying claims, discuss quadratic growth, and collaborate and persist in problem-solving. Negotiating different student-constructed representations of a problem also gave them opportunities to act with agency, as they made choices and judgments about the validity of the different perspectives. These findings have implications for the importance of giving all students access to mathematics through representations, with representational thinking serving as a central disciplinary practice and as a learning practice that supports further mathematics learning.

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