Growth Mindset Thinkers
Video: Teaching for Robust Understanding of Mathematics

My background is as a mathematician. I got into mathematics because I love it. And I came to realize that many students didn't have the same kinds of opportunities that I had as a math student. To experience the beauty, the power, of mathematics. To feel that you can be doing something that's both intellectually interesting, and provides opportunities to do a lot of sense-making.
So many years ago now, I read a book called "How To Solve It" by George Pólya, which introduced me to the ideas of structured ways of doing mathematical problem solving. And my reaction was, "Gee, this is really neat. How come nobody ever told me about it? Maybe there are systematic ways you can study mathematical thinking and learning so that you can make the power and giddy of mathematics more accessible to more people." The real question being, How do you open it up so the people can have the kind of pleasure of engaging in mathematics that I did and become more powerful mathematical thinkers?
When I started some 40 years ago, I thought that would be maybe a five-year project. Here I am. It turned out to be a lot more complex than I thought. The first work was, What does it mean to be a powerful mathematical problem-solver? And I spent a good decade just asking in Pólya's sense, "What does it mean? How does one go about solving problems effectively?" You're thrown something new, how do you make sense of it? How do you make progress on it? Ultimately that's what you want for all people who learn mathematics. Because when you go out in the real world you never find problems that are posed the way you find them posed in textbooks. What you have to do is use the knowledge you have in new and creative ways to solve problems.
So the first -- excuse me -- the first large part of my work was devoted to just figuring out, What are the things that contribute to effective problem-solving? Then the real question was -- well, after that I started teaching a problem-solving course. And that lead to the natural question, How do you think about the things you can do as a teacher to support kids in becoming powerful mathematical thinkers? And that in turn led not only to my own work, but to work with teachers and the whole school districts and others, asking the question, What are the properties of the kinds of mathematical classroom that will produce kids who are powerful mathematical thinkers and problem-solvers? So that's the question at the heart of the teaching for robust understanding of mathematics framework. We call it TRU.
So the serious question that I set out to work on now more than a half a dozen years ago was, Can we come up with a framework that identifies the small number of things that really matter? That have the filing properties that they all count, so when I talk about them you'll recognize them, and you go, "Yeah, that really matters." Number two, that if you put them all together, you've basically covered the waterfront so that you can say not only do these things matter, but basically if you're doing all of these things right, kids will be powerful thinkers when they emerge from that classroom. And they need to be what I call actionable. That is not only can you recognize them, but you can work on them.
So the goal was, Can we come together with a framework that says, "Here are the things that you need to attend to," so that if you do well on this small number of things, the kids who will emerge from this classroom will be powerful mathematical thinkers.
For me, being mathematically powerful means being able to use the ideas you have in the service of solving challenging problems, some of which you encounter in real-world contexts.