

## Encouraging Multiple Models In Problem Solving

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1. **Choose:** Encourage individual choice of physical and pictorial representations.
2. **Explain:** Ask students to explain what the parts of their pictorial representation mean and to explain the relationships between those parts.
3. **Justify:** Challenge students to defend their choices. Challenge students' correct representations just as much as you would ask them to justify incorrect representations.
4. **Model:** Explicitly model new forms of diagrams or manipulatives that you choose to use, explaining your decisions as you demonstrate how you are using the tool. We are not suggesting you explicitly teach students to use the tool. Simply model your own thinking process as you employ a visual, but reinforce to students that you are held to the same standard for justifying your decisions as they are.
5. **Connect:** Ask students to describe how two representations or models relate to each other. Encourage them to identify how each element of the problem appears in each model. Ask them to explain when they might prefer one model or representation over another.
6. **Share:** Ask students to explain a novel visual approach to their peers and discuss how they model their thinking process.
7. **Expect:** Communicate that you expect to see visual diagrams or manipulatives used to explain mathematical ideas.
8. **Crash:** No representation works in every context or situation. Expect any model to fail at some point, and encourage students to change their representation when the model crashes