

MindBugs-in-Science

The MindBug is a misconception in student thinking. Like a virus, MindBugs can spread through a student's number and conceptual systems. Avoid and debunk misconceptions through active, engaged learning and through reinforcing connections.

MindBugs Modules reach all learners through hands-on activities that engage the senses and by creating connections to math, history, art and the other sciences.

The Model

There has been a lot of discussion regarding how many E's are required for an effective learning model. In MindBugs workshops teachers have decided that the best model is actually $(4E)^2+E$, but because that isn't very memorable and this is primarily a science module, we'll use 5 E's.

1. **Engage** learners
2. **Explore** the topics actively
3. **Explain** what was explored
4. **Evaluate** to assess content knowledge
5. **Extend** the concepts and skills

The 5 E's is more accurately described as $(4E)^2+E$ because the process isn't linear for most learners. Students generally need to explore the concepts more than once and in more than one way before evaluations show they have mastered them to the appropriate level. The strides they can make with multiple explorations can have an exponential effect on discovery and performance.

Though only the first E encompasses the word, Engage, every day should be engaging. Keep students interested with hands-on activities and cross-curricular connections.

The Model Applied to MindBugs

Educators **Engage** students through attention-grabbing and imagination-tapping demonstrations. MindBugs demonstrations usually present a discrepant event; something students have seen before but haven't really noticed. Without paying real attention they've drawn incorrect conclusions. They've built mental bridges to nowhere and created their very own MindBugs.

Following the demo, students jump right in to get their hands "dirty" with individual activities.

Students **Explore** the concepts through hands-on activities. Some activities are done individually and some in groups. Hands-on exploration helps all types of learners succeed.

Educators always **Explain** activities after students have completed them. Many learners make the critical connections only after experiencing the phenomenon first-hand. Lesson plans and a Power Point presentation are provided for each session in case projection technology is available in the classroom.

Evaluation can also be called Assessment (but that messes up the acronym). Whether the results are used to design future instruction or to rank students, it is important to gauge what they have learned and what they need to improve upon. Assessment questions based on the NAEP (National Assessment of Educational Progress) are provided for each module.

Students **Extend** the concepts and skills through...well, extensions. Math activities, historical references and stories as well as journal exercises are all effective ways to create critical connections and reinforce concepts and skills over and over.

My favorite part of the MindBugs workshops was that they got us engaged in the activities and THEN explained them. I liked that so I know my students will too.

*Debra Green
Science Teacher
Macon County Middle School (GA)*

