Encouraging Active Learning

Using Simulations During Whole Class Instruction

Laura Chervenak

By Laura Chervenak

As a member of the ExploreLearning Professional Development department, the most rewarding part of my job is helping teachers appreciate all of the ways Gizmos mathematics and science simulations can help their students experience academic success.

More and more, we hear from teachers and school administrators who say their computer labs and laptop carts are less available for one-to-one instruction, due to competing demands such as computerized testing. As school districts transition to digital content, teachers struggle to integrate the virtual curriculum into whole class instruction.

In this article, I will be highlighting whole group instruction best practices when using simulations to maximize student engagement and achievement.

What Is a Simulation?

Manipulatives (blocks, rods, bean sticks, etc.) are commonly used in mathematics instruction. In recent years, some of these manipulatives have been developed as "virtual" versions. Simulations can be thought of as a type of virtual manipulative that enables students to go beyond manipulating objects, and demonstrates effects in a system that may not always be seen with manipulatives.

ExploreLearning Gizmos are web-based simulations that allow students to experience mathematics with a hands-on approach. This technology-enabled content helps students better understand content and explore concepts and helps teachers integrate 21st-Century skills into mathematics instruction.[1]

Planning the Lesson

Clear objectives should be the first step of the lesson planning process, then decide how you will assess student learning towards those objectives. Be sure to identify the content and practices you want students to demonstrate.

Finally, you should plan learning experiences and instruction to support the evidence you expect students to demonstrate.

Once you find the right simulation or activity, determine how you will use it to meet the learning standard(s). Thoughtful lesson planning can be the difference between an "okay" lesson and a vibrant effective lesson.

Each Gizmo comes with an easily customizable Student Exploration Sheet, Teacher Guide, and Vocabulary Sheet to plan the whole class instruction script. With Gizmos Lesson Materials, you can prepare a lesson in 20 minutes and end up with a three-day series of lessons by combining the Gizmo, textbook exercises, and assessment activities.

Remember, don't reinvent the wheel. The best teachers are those that know how to use what they have. Try to modify lesson materials to meet your needs.

For an example, check out this video [bit.ly/1o3e5lE] where I model how to create a lesson.

During the Lesson

Simulations like Gizmos offer unique opportunities for students to make predictions and then test the results. Promoting student responses to such questions via whiteboards, student response systems, or just a show of hands for agreement/disagreement with other kids' stated predictions are a great way to engage the class.

However, without a solid plan, students can easily become disengaged during a lesson in a whole class setting. Students who are not called on to answer a question can passively wait for the answer to be given to them, rather than thinking it through for themselves. To ensure that all students are participating and active, try these great ideas to make your lesson student-centric.

- Allow the students to control the simulation. If you have an interactive whiteboard, select a student to manipulate the controls. You can also have students use physical manipulatives similar to the simulation at their desks. This will allow them to follow along and explore even when they aren't using the technology directly. The user Lesson Materials for Toy Factory Gizmo, a simulation that has students model fractions, includes a page of toys from the Gizmo created by using the snapshot tool. Students can cut out and use the toys to participate in a whole class lesson.
- Have the students make decisions about the activity. Whenever possible, have the students decide what to do next. As you are following your Student Exploration Sheet, you will see many places where you can select variables or settings. Ask students to make those choices rather than just doing it yourself. Don't say something the students can say. Rather than the teacher doing the explaining and the students doing the listening, reverse the dynamic. Sometimes this is difficult for teachers who are used to explaining concepts. For one lesson or one hour each day, practice speaking only in questions!
- Give students time to think. Provide students with ample wait time so that they can process the question and formulate an answer.

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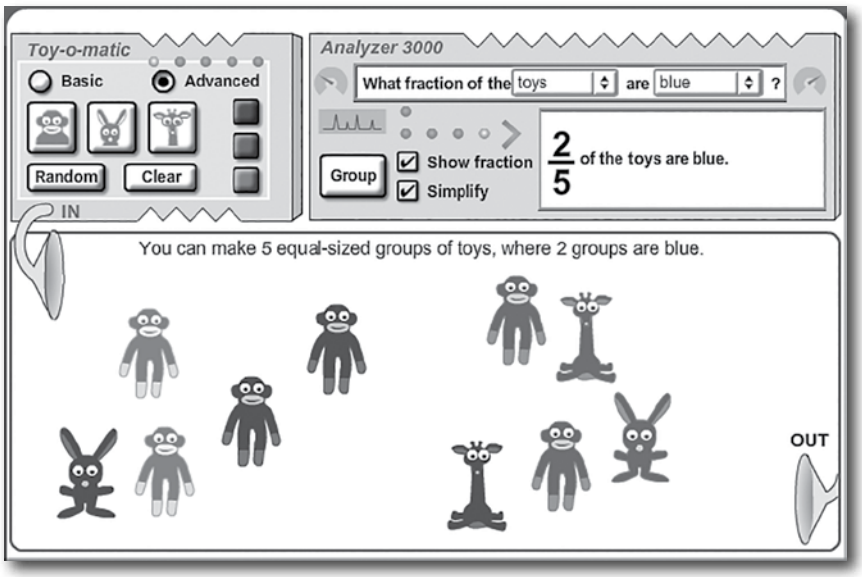
Mentally, count off 3–5 seconds at a minimum before taking an answer. You can also ask students to write down their answers first. You can even use individual response systems (electronic or whiteboard) or an iPad so that students can answer the Gizmo assessment questions individually or as a group.

- Provide neutral feedback. Research shows that when teachers respond to students' responses with negative or even positive comments such as, "Good job!" or "Not quite," students will respond less often.[2] Rather than offering judgment in your responses to students, reply with neutral comments such as, "Thank you."
- Follow up students' responses in ways that encourage deeper thinking. One of my favorite follow-up questions is to ask, "What evidence supports your answer?" This prompts students to provide not only the 'why' behind their answer but also specific support. In addition to asking the responding student follow-up questions, it is beneficial to ask the rest of the class to weigh in with a hand signal. Use a thumbs up to indicate agreement, thumbs down for disagreement and a thumbs to the side if the answer is okay, but there is something missing that would allow for full agreement. With this strategy, all of the students are thinking deeper about the answer given, and not just the responding student.

To make the most of questioning in a whole class lesson, plan key questions prior to class so that you can word them with precision. Think about your lesson objectives as you plan questions. They should be ordered logically to move students towards those objectives, supporting their learning along the way.



A screenshot of the Toy Factory Gizmo

Because teacher questioning is key during whole group instruction, ExploreLearning provides great questions at various levels of Bloom's Revised Taxonomy in our Student Exploration Sheets included with every Gizmo. Teachers can also refer to the Teacher Guide discussion questions and even the assessment questions for more inspiration.

After the Lesson

Just because class is over, doesn't mean learning has to stop. Simulations can be used at home, and assessments are needed to provide evidence of learning. Here are a few final ideas.

- Exit tickets are a quick and simple way to assess student learning. Gizmos Lesson Materials and Assessments provide numerous questions that can easily be used as an exit ticket prompt.
- Differentiated homework (with or without a computer.) By using snapshots of Gizmos and data, you can create homework where students can practice the skills learned in the whole group lesson without the need for a computer. Or, for students that have computer access at home, give them a second option so that they can use the Gizmos at home.

After completing your lesson, review its effectiveness. Did student demonstrate understanding? Could it have been improved with more practice?

Check out the full whole class lesson series on the ExploreLearning blog [bit.ly/1sEP4ss].

Take a free 30-day Gizmos trial and see how our simulations can be used in whole class instruction [bit.ly/1qJft6B].

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[1] Marzano, R. J. (1998). A theory-based meta-analysis of research on instruction. Aurora, CO: Mid-Continent Research for Education and Learning.

[2] Rowe, M. (1974). Relation of wait-time and rewards to the development of language, logic, and fate control: Part II—Rewards. Journal of Research in Science Teaching. 11(4), 291–308.