



# RESEARCH BRIEF

## Gizmos™:

## Can They Improve Student Learning in Mathematics and Science?

### WHAT ARE GIZMOS?

Gizmos™ are interactive, virtual simulations designed to support and deepen student understanding of concepts and principles found in math and science curriculum in grades 3-12. There are currently 450 Gizmos™ and accompanying materials available for use that are aligned to content standards in many states, and with textbooks used across the country. In Duval County, these simulations were provided by the Academic Services Department as a resource for teachers to use in working with students to develop a deeper understanding of challenging math and science concepts. Gizmos™ can be used with students for independent study, in small groups, or with an entire class to reinforce or deepen a teaching concept or principle.

### HOW DO GIZMOS™ IMPROVE LEARNING?

The value of using simulations as an instructional resource for teaching mathematics and science concepts is based largely on the work of Robert Marzano and others who previously summarized hundreds of research studies and identified four techniques shown to have a substantial effect on student achievement:

1. Representing new knowledge in graphic forms;
2. Using manipulatives to explore new knowledge and practice in applying it;
3. Generating and testing hypotheses about new knowledge; and
4. Presenting new knowledge followed by application.

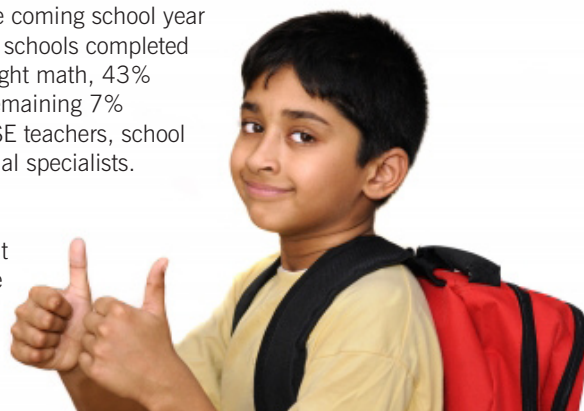
Gizmos™ employs all four of these evidence-based strategies in the construction of simulations for students. According to this research, the human brain stores knowledge in both words and images, and instruction that targets both can increase students' retention and comprehension of complex ideas.

### WHAT WAS DONE?

During the 2009-2010 school year, middle schools in Duval County implemented *ExploreLearning's* computer-based simulations, known as Gizmos™, with instruction in math and science. Middle school teachers were provided with Gizmos™ training by program staff in the fall of 2009. In order to determine how teachers were using the product, an electronic survey was sent to all middle school math and science teachers at the conclusion of the school year. Questions on the survey asked about teacher satisfaction with aspects of the simulation programming, how well program content aligned with math and science content standards, and their plans for using Gizmos™ in the coming school year (2010-2011). Teachers from 27 middle schools completed the survey with 48% indicating they taught math, 43% reporting they taught science, and the remaining 7% representing other positions including ESE teachers, school standards coaches, and other instructional specialists.

### SURVEY SAYS....?

Highlights of survey findings showed that teachers (responding to the survey) were well-satisfied with the quality of training they received by the company (87%); were pleased with the usefulness and



accessibility of data generated from Gizmos™ in relation to math and science instructional objectives (80%); and that these computer-based simulations were engaging and attractive for students (78%). The most important items on the survey had to do with alignment of the Gizmos™ content with curriculum taught in math and science. The majority of teachers (62%) felt that these manipulatives were well-aligned to the district curriculum and to Florida performance standards. Teachers reported that content area vocabulary and concepts found in Gizmos™ are similar to what students might encounter on the FCAT (56% thought they were “somewhat” similar and 41% believed they were “very similar”). The majority of teachers (56%) described themselves as “quite confident” in the ability of Gizmos™ to expand and deepen students’ content learning; and 64% of teachers stated that they would definitely use the program as part of their planned instruction.

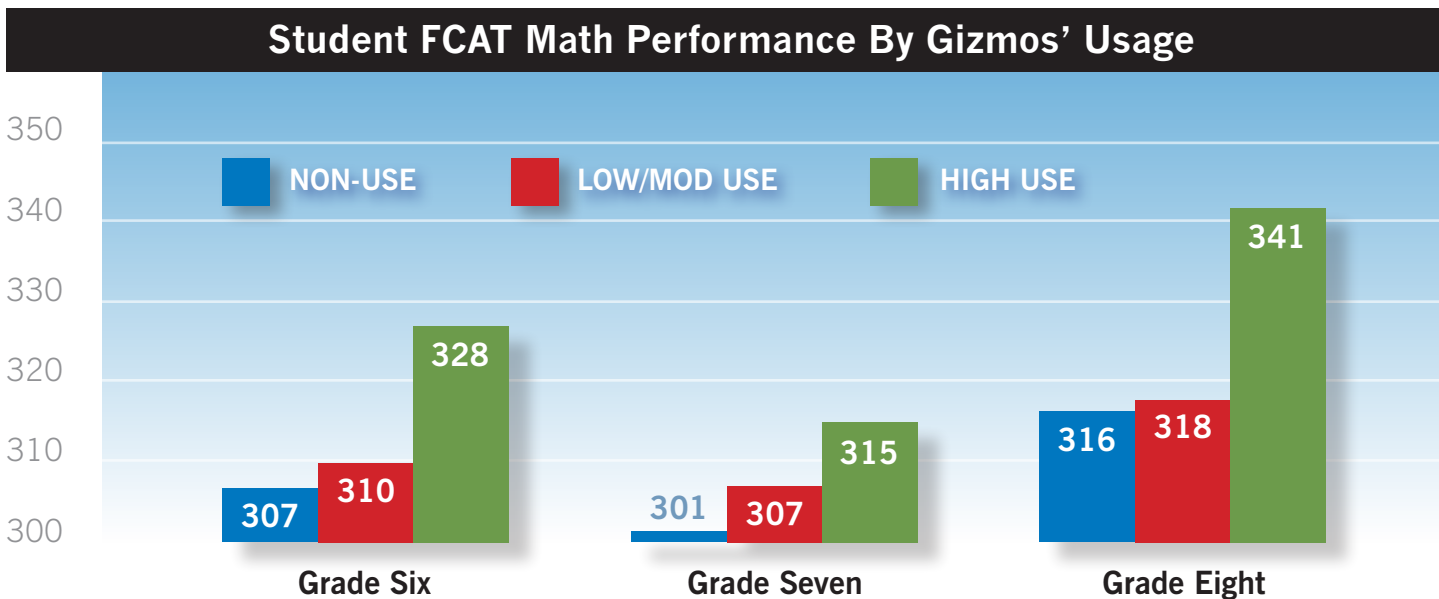
### GIZMOS™ USAGE AND STUDENT ACHIEVEMENT

These interactive simulations are designed to support and deepen the understanding of concepts and skills by students, but we cannot determine the extent to which this might be true without knowing whether and to what extent Gizmos™ were used by teachers. *ExploreLearning* staff provided the requested program usage data so that we could determine how much the program was used for students in individual math and science classes. A usage factor was calculated from Gizmos program data based on the number of teacher and student log-ins and Gizmos™ views of instructional content. Teacher usage was categorized as non-use, low to moderate use, and high use. As the usage level of math Gizmos™ increased, there was a comparable increase in the average FCAT mathematics scale score of students taught by those teachers. At this time, there is insufficient data to draw conclusions about how Gizmos™ might contribute to similar gains in science.

#### See Figure 1: Student FCAT Math Performance by Gizmos’ Teacher Usage

*This analysis of Gizmos™ simulation usage in relation to student mathematics performance is not definitive, but does provide early promising evidence that the district’s investment in this computer-based interactive tool for supplementing middle school math and science instruction is having the desired benefit. Next steps will likely include determining whether all teachers are utilizing the program as recommended, and whether particular instructional objectives might be paired with identified Gizmos™ views, based on the specific needs of students and groups.*

**Figure 1**



#### ABOUT THE AUTHOR:

**Katherine Divine, Ph.D.** is an experienced assessment and evaluation specialist currently serving in a shared position with Duval County Public Schools as *Executive Director for Research Design and Evaluation* at the Schultz Center. Her past experience includes tenure as a *Research Associate* at the University of North Florida (Florida Institute of Education); *Director of Research, Evaluation and Accountability* for the District School Board of Pasco County; and *Director of Research, Communications, and Student Services* for Portsmouth Public Schools in Virginia. For more information about how programs are evaluated for effectiveness, or for other reports and publications, feel free to contact us or visit [www.schultzcenter.org](http://www.schultzcenter.org).