el Gizmos

Supporting Skills and Knowledge with Gizmos Digital Simulations in the Classroom

STUDY OVERVIEW

Insights from teacher surveys on how Gizmos contribute to student learning.

The ExploreLearning Professional Development team conducts teacher surveys to monitor product usage and implementation, and provide feedback to district leaders from their teachers. This research brief is an example of the insights we routinely draw from those surveys.

The current study includes teacher survey responses from seven districts across the US and Canada (Table 1) that used Gizmos between 2017 and 2021. All districts engaged in professional development training during the survey year to support successful implementation.

TABLE 1: DISTRICT ENROLLMENT AND DEMOGRAPHIC DATA FROM 21-22 SCHOOL YEAR

	Number of teacher responses	District enrollment size	Percent of Families below poverty level	Community demographics	Country/ Region
District 1	142	178,479	7%	49% white, 10% Black, 16% Hispanic/Latino, 20% Asian	US South Atlantic
District 2	90	21,177	30%	41% white, 45% Black, 7% Hispanic/Latino, 2% Asian	US South Atlantic
District 3	66	52,335	19%	9% white, 69% Black, 13% Hispanic/Latino,5% Asian	US South Atlantic
District 4	44	194,607	28%	24% white, 23% Black, 44% Hispanic/Latino, 6% Asian	US West South Central
District 5	56	36,557	12%	16% white, 5% Black, 63% Hispanic/Latino, 13% Asian	US West Pacific
District 6	35	315,787	16%	41% white, 12% Black, 32% Hispanic/Latino, 10% Asian	US Mountain West
District 7	258	2,028,685	10%	72% white, 4% Black, 18% Asian, 2% First Nation	East-Central Canada

An online survey was sent to all the teachers in the district who used the program, asking them to reflect on their experiences using the program with their students. The surveys were customized based on the district's implementation strategy and their information needs. The current research brief presents the results of a qualitative analysis of all codable responses to one open-ended question asked on all the surveys: <u>**"How has using Gizmos contributed to student learning in your classroom?"**</u>

FINDINGS

Responses from 691 teachers (101 Elementary, 237 Middle School, 344 High School, 9 multiple grade levels) were coded using an inductive coding method. The first pass of coding involved identifying distinct statements within each teacher's response, which resulted in a total of 1195 codes. These codes were then grouped into meaningful categories, using an iterative review process until the most prominent themes emerged. These categories are described below, with representative quotes from teachers featured.
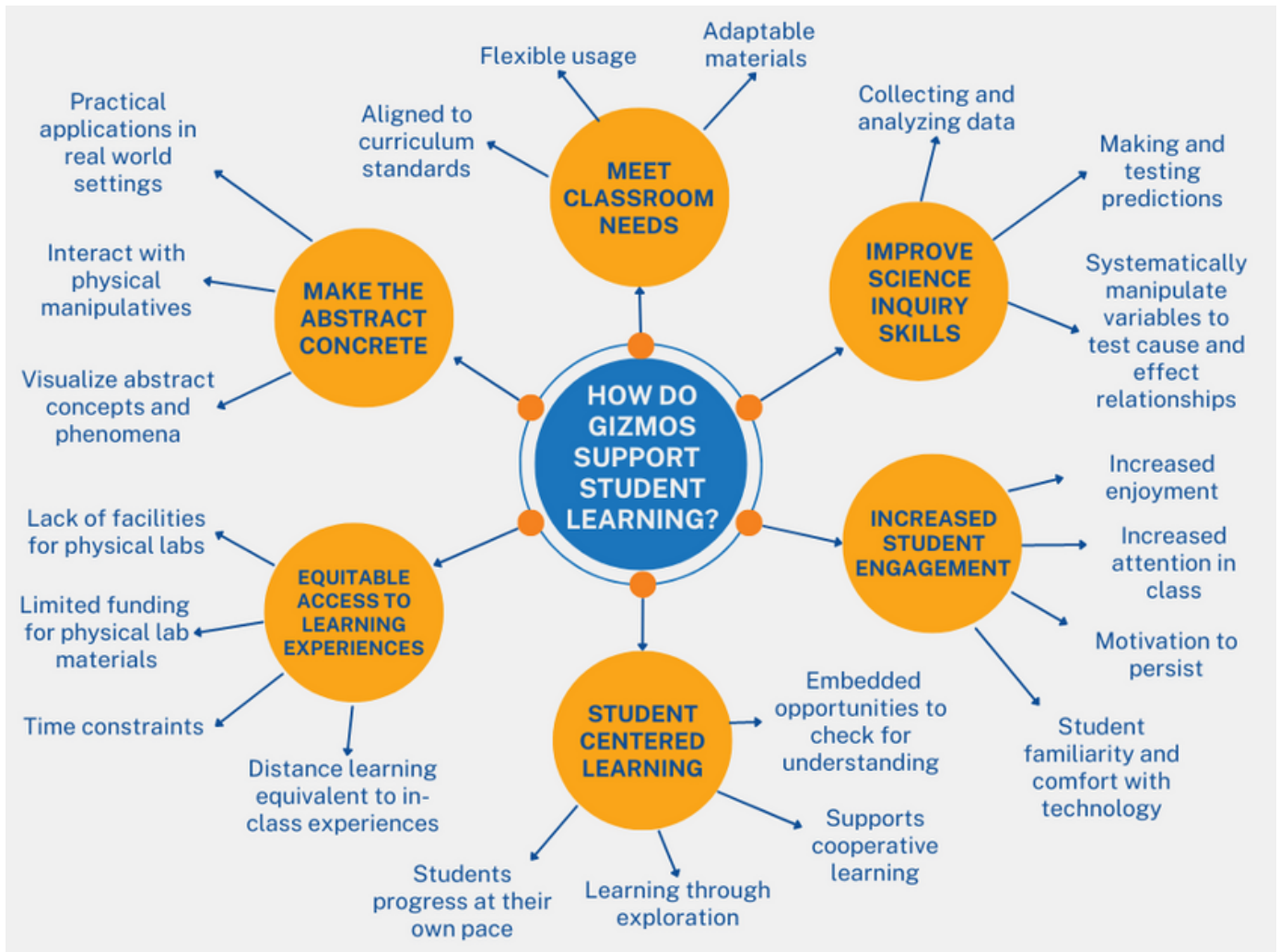
Making Abstract Concepts Tangible, Visible, and Interactive

Several teachers noted the ability of Gizmos to make difficult or abstract constructs and phenomena (e.g. cellular processes, electricity flow, greenhouse gas effect, internal biological systems) more concrete. Students can observe these processes that they would not otherwise have access to in a traditional, physical lab.

> *"There are many phenomena outside of our ability to directly observe, and this is another way Gizmo excels. The models make the science available to teens who struggle to conceptualize more abstract topics."*

Gizmos makes the connections between variables directly observable, with the ability to interact with and manipulate variables.

> *"When they manipulate the variables it really helps to bring the concepts to life…I teach Biology and much of what we talk about happens inside of your body...so the Gizmos help them see what is going on!"*

Teachers noted that making concepts tangible led to observable increases in conceptual knowledge via classroom behaviors and formalized assessments.

> *"Through the use of Gizmos I have seen the consolidation of ideas and have seen students have "Ah-ha!" moments in their thinking."*
>
> *"When using Gizmos, I noticed that my student assessment data improved because students were better able to explain the concepts."*

Equitable Access to Learning Experiences: Barriers to Physical Labs

One of the most common responses among teachers was how Gizmos were critical for supporting equitable access to lab-based learning experiences for all students. Barriers to running equivalent physical labs included a lack of lab space, limited materials, insufficient budgets, time limitations, and safety constraints.

> *"My program cannot use glass, many reagents (outside of kitchen chemicals), and does not have access to water. Instead of leaving teens behind in academic opportunity and achievement, Gizmos allow me to level the playing field."*
>
> *"We can model a lot of stuff that we couldn't possibly do in the classroom because we don't have space, materials, time or money to do many of the activities!"*

In addition to providing in-person access to lab-based activities, Gizmos can be used in online-only environments, providing an equivalent learning experience for students who miss a lab or need to be remote. Absentees can catch up at home without missing out on a hands-on experience, supporting greater equity in access to learning.

> "Gizmos has really helped implement an exploratory portion to online distance learning. It has been one very viable substitute to hands-on labs."

> "Gizmos was a tremendous help while distance learning last year, and I will continue to use the program this year for students who may be absent for a lab."

Improving Scientific Skills through Inquiry-Based Learning

Many teachers noted that Gizmos helped increase their students' scientific inquiry and reasoning skills, including making and evaluating predictions, observing relationships between concepts, and interpreting and drawing conclusions from data.

> "My students have a deeper understanding of science principles and the inquiry process as they have the opportunity to manipulate variables."

> "Students are able to explore their own questions, investigate them, and record data from Gizmos to provide evidence to answer their question."

Teachers also noted the limitations of physical labs when it came to creating original data sets, including increased errors and difficulty repeating experiments, making Gizmos more efficient and accurate for data generation and analysis activities.

> "It's also harder for the students when they don't get the "expected" data/results so the online simulation allows them to practice multiple times."

> "It clearly provides students the expected lab outcomes without the errors during an actual lab."

Increasing student engagement and motivation through technology

Increased student engagement and enjoyment with Gizmos compared to other teaching methods was mentioned by a large number of teachers.

> "Student engagement increases greatly. They love Gizmos!"

> "It has been such a huge impact! My kids love using it and it is very engaging."

Teachers also noted that as "digital natives," their students felt comfortable using Gizmos in and out of the classroom.

> *"Students already love using technology, so they are automatically engaged and interested in using Gizmos as a learning tool."*

Student interest and engagement also mapped on to higher levels of motivation and persistence in traditionally challenging activities.

> *"Students enjoy the assignments and I have a higher number of students complete Gizmo assignments than other types of assignments."*

Opportunities for Student-Centered Learning

Many teachers noted the benefit of Gizmos for incorporating student-centered, exploration-based learning activities in their classrooms.

> *"The discovery labs are very beneficial for the students. Rather than being told they do it themselves and internalize the concept."*
>
> *"I also appreciate the opportunity to allow them to develop their own explanations for why things happen the way they do by letting them 'play' through an activity without guidance."*

They frequently highlighted the ability of students to move at their own pace, monitor their own learning, and engage in repeated practice as key ways that Gizmos contribute to student learning in their classroom.

> *"Gizmos allows my students to go at their own pace and teach themselves in a way that I might not be able to in my own instruction or own words."*
>
> *"The self-directed pace works really well for students because they can go at their own pace and go back as needed."*

Teachers also noted that Gizmos allow them to play the role of "support", monitoring student learning and intervening when needed to optimally support differentiated learning.

> *"They appreciate the dynamic interaction between themselves, the Gizmos activity, and the teacher, who is there on an as-need basis, providing individualized assistance to help them complete the Gizmos activities in a timely manner."*
>
> *"Students enjoy being able to work at their own pace. When students are working on a Gizmo, they are free to go as quickly or slowly as they need to. Because I am free to check in on them, I can offer support and feedback where it is needed."*

Adaptable and Flexible to Support Classroom and Teacher Needs

Across teachers' answers, there were a variety of ways in which they utilized Gizmos both in and out of the classroom, including small group work, whole group work, individual assignments, flipped classrooms, and at-home make up labs. This flexibility in implementation allowed teachers to use Gizmos however best fit their and their students' needs.

> *"I project [Gizmos] on the screen and we play "pass the mouse" and take turns using the manipulatives."*
>
> *"An excellent opportunity for guided learning when I'm away and a non-specialist sub is brought in."*
>
> *"Teaching a split grade can be especially difficult with science. I sometimes set one grade up with a Gizmo so I can focus instruction on the other, then switch."*

Since Gizmos are aligned to a variety of curriculum standards, teachers were able to use them flexibly where needed for additional teaching or assessment support.

> *"If kids miss an in-class lab activity, we assign a Gizmo to complete to cover the same expectations."*
>
> *"Gizmos fit perfectly with curriculum expectations. The Evolution Gizmo on the Peppered Moth in Biology will be used this year by all the biology students for their performance task."*

Teachers could easily use Gizmos for differentiated instruction, tailoring their use to meet individual student needs.

> *"Since they are self-directed, it has allowed me to spend more time with my identified students (or weaker students)."*
>
> *"Gives the teacher a chance to provide some small group instruction as needed with the other students engaged in an activity - a focused one at that!"*