

3D Pilot Program Case Study

Texas Instruments DLP® projection technology earns high marks from classroom teachers in pilot tests

3D Displays Create Greater Student Enthusiasm and Higher Scores



Ask almost any teacher and you'll get a consistent viewpoint: abstract concepts are often the most difficult to convey and explain – particularly in lower grades. And for students, these topics can be among the most challenging lessons to grasp – often leading to frustration and disengagement. Now, thanks to advanced DLP projection technology from Texas Instruments, classrooms are harnessing the power of 3D projection to take a variety of lessons to entirely new levels – literally adding a new dimension that creates engaging and effective instruction on challenging subjects.

The DLP 3D display captures the attention of students – bringing the “wow” factor from the movie theater to the classroom - and creates an immersive environment in which students can learn more and retain that information from clear and vivid presentations.

A 3D-ready DLP projector typically costs no more than a standard 2D projector used in classrooms today and, unlike other 3D technologies, only one projector is needed to create vivid 3D imagery. DLP

3D-ready projectors – available from a wide variety of manufacturers - function normally as regular 2D projectors and switch to play 3D content and back again. Using samples of a 3D curriculum, three schools recently reported preliminary findings that showed very promising results.



Shelton Schools:
“Even at that rapid pace, we saw excellent results”

At Shelton School, the nation's largest private school serving learning-different students, the goal is to provide the best individualized education path for every student. The school provides learning-different children a full, effective curriculum through individualized, structured multisensory programs. Major learning differences include dyslexia, attention deficit hyperactivity disorder (ADHD), and speech and language disorders.

The school completed a one-week pilot test to explore the possibilities that a 3D curriculum can provide in middle-school math. According to Lauren Sanders, a

math teacher for students in fifth and sixth grades, the trial was a tremendous success. “Our school caters to students with learning differences and we've made a significant investment in various learning technologies,” she said. “We've used interactive whiteboards for years, for instance. We wanted to see if 3D projection could make us even more effective, so we delivered three lessons on volume, symmetry, and solid shapes over the course of one week. It went very well.

“The kids were thrilled to participate and loved the Xpand glasses – they thought they were very cool. Our school has many students with ADHD, but I found that my class was much more focused when we introduced the 3D lessons. Usually, I get lots of questions through which they confirm their understanding of the material and the processes. But this time, I received far fewer questions – they were more patient and eager to explore the content.”

“The rotational symmetry portion was very good in 3D since that's hard to re-create on a two-dimensional flat surface. Volume was also good because they could see complex shapes broken into cubes. Then we'd compute the volume of each cube and then add up the results to get the total volume. That was really helpful.”

Typically, Sanders and other teachers at Shelton teach a topic over the course of a week. The second week is devoted to mastery and in the third week, students are tested on the material. “This was a much quicker pace, compared to our usual rate,” said Sanders. “But even at that rapid pace, we saw excellent results.”

Steve Robertson, statistician for the Shelton School research team, analyzed test scores for the pilot program, noting



improvements in test scores of students in the 3D classroom. He compared the improvement in pre- and post-lesson test scores, finding that students in 3D classrooms generally saw score improvements over students who were taught in Shelton's standard curriculum and with standard instructional methods.

"For all three subject areas - volume, symmetry, and solid shapes – the test group achieved consistently better scores than the control group," he said. "The effect of the 3D curriculum on instruction was meaningful compared to our standard instruction with interactive whiteboards. I can only speculate that the score delta would be even greater in classrooms that use standard whiteboards or chalkboards today. Now, there are certainly some constraints in our study – particularly with our small sample sizes – but it certainly encourages us to want to explore greater use of 3D at Shelton."

Once the pilot was complete, Sanders realized that the "control group," which hadn't received 3D instruction, deserved a chance to see the lessons delivered in 3D. "I asked them, 'Looking at this, are the concepts clearer?' and it was a real 'A-ha!' moment for the kids. One of them said to me, 'Oh – so that's what you were trying to do on the whiteboard.' With 3D, it just all clicked, which was neat to see.

"3D can be an important component of teaching – but there still needs to be a good complement of styles and tools. I can't envision teaching a 50-minute class solely in 3D. It has to be intermixed with manipulatives, the whiteboard, discussions, and examples. That also keeps the novelty of 3D, which is important."

Hamilton Park Paceetter Magnet: "Their understanding of these abstract concepts just blossomed"

This K-6 school in Dallas attracts students from across the Richardson Independent School District boundaries, drawn to its unparalleled academics, leadership, and innovation. For third-grade teacher Brittany Russo, the Classroom3® 3D lessons from JTM Concepts lessons in symmetry and volume were an ideal complement to her use of manipulatives, computer clips, examples, and group work. "The students just LOVED this," she said. "It can be hard to keep kids' attention – there are only so many pictures you can show before some kids get bored or frustrated."

My kids are especially 'hands-on,' and weren't getting these concepts when we looked at them on paper. But when we taught the same material in 3D, their understanding of these abstract concepts just blossomed. Some of my students who used to have a hard time finally grasped the concepts and enjoyed learning. They were excited to do the pages in the workbook because they actually understood the material. The classroom environment also changed when we handed out the 3D glasses from Xpand. The kids commented that they felt like they were transformed into futuristic robots and liked the high-tech feel of wearing the glasses."

"One of my students actually said to me, 'We are actually having fun while learning

– that never happens.' And our post-lesson test scores had the best averages – and I was the only one using the 3D lessons - so you'd have to say the 3D display had a great impact on their learning."

Principal Megan Timme underscored Russo's observations. "I believe the kids are more engaged because they are able to take abstract concepts and make them more concrete in their minds. An engaged child is a successful child." >>>

DLP technology uses millions of microscopic mirrors that reflect light to create a stunning picture for the best projectors on the market. This imaging technology is so fast, it can actually project TWO images on the screen at the same time: One for the left eye and one for the right eye. Then 3D glasses combine the two images to create an amazing 3D effect. DLP 3D technology is available from a wide variety of projector manufacturers.



Another Hamilton Park teacher added, "This is one of the most beneficial tools we've ever had. They actually paid attention because it was neat. They're learning and they're having fun."



Boulder Valley School District:

"A tremendous teaching and learning experience"

In Colorado, the Boulder Valley School District has also begun to leverage the application of DLP 3D projection in some of its fourth-grade classrooms. When Dawne Mangus fired up the 3D projector in her classroom, she saw something in a whole new light – her students. "We had previously been studying the sun and moon," she said. "But I didn't prep them for what was to come – I just let them explore the solar-system lesson in 3D from Classroom3 and they were so engaged. They were guessing the planets and marveling at the asteroid belt. What really pleased me was they were able to guide the discussion and make their own discoveries and use their own prior knowledge. When we looked at Jupiter, one of them said, 'Hey, that's the planet with all the moons!' so that was great to see. We went through the material in about 40 minutes and we never stopped talking – in many ways, they taught each

other. It was just a tremendous teaching and learning experience for them and me."

Although not statistically rigorous, Mangus delivered a simple five-question pre- and post-lesson test and compared results. "I had a learning gain of 54 percent and virtually every student had improvements in the post-test," she said. "I want to see some more of these lessons – I think this could be very valuable in the classroom."

Boulder Valley is also assessing the use of 3D projector technology in classrooms within a low socio-economic middle school, a high-performing high school, and a unique day-treatment program funded by a community partnership. In their efforts, Boulder Valley has focused on the what, how, and why of classroom 3D:

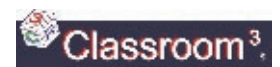
- **What** - Concentrating on locating and employing effective 3D learning objects, micro-simulations, and complex simulations that support the mastering of BVSD curriculum essentials.
- **How** - Using the 3D experience in creative ways, including preloading and reloading course content, extending the learning, using the content with higher-order questioning to probe for deeper understanding, aiming at misconception, and creating what-if situations from simulated environments.
- **Why** - Using the 3D experience to leverage the benefits of visualization, concreteness in learning, and to eliminate persistent achievement gaps found in classrooms.

Based on these preliminary findings, Texas Instruments will continue to work with existing pilot sites and seek new schools with various student and teacher dynamics to continue refining its approach to 3D in the classroom.

What Students Say About Texas Instruments' DLP 3D Technology

- **"It gives you education in a fun way."**
- **"How can you not pay attention when it's coming right at you?"**
- **"I'm able to visualize. I understand more than in a textbook."**
- **"If you see every angle, you get more of an idea of what it is. You understand better."**

Materials for these 3D Pilot Programs provided by:



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