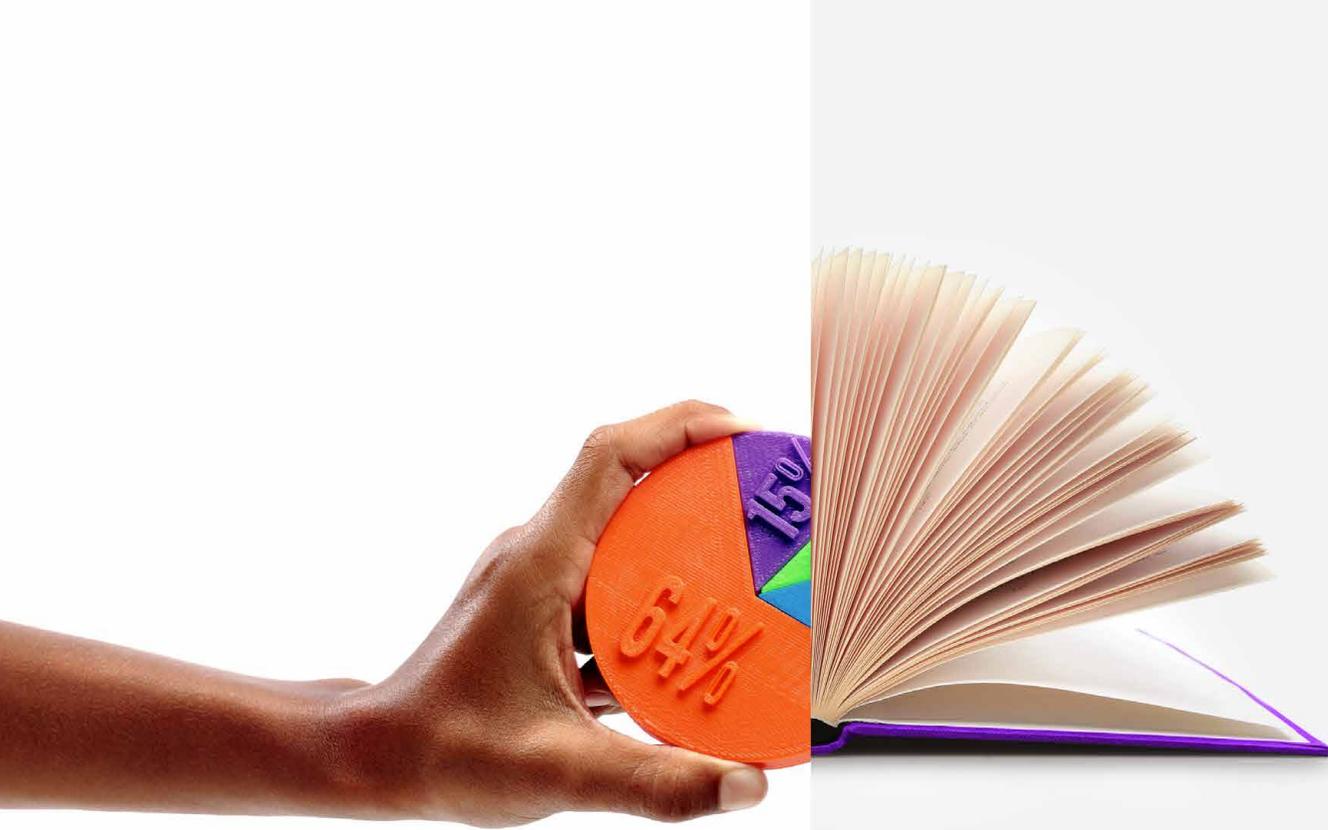


Building a New Educational Foundation with MakerBot

Nishuane Elementary and the STEAM Skills That Last a Lifetime



Inspire, Engage, and Prepare Tomorrow's Innovators

Educators who use MakerBot are transforming the students of today into the innovators of tomorrow. With this in mind, the Montclair School District installed at least one MakerBot Replicator 3D Printer (5th Generation) in every school in the district. Nishuane Elementary, one of the recipients, entrusted Technology teacher Donna McGowan with a mission to prepare students with a learning foundation they can count on. With a MakerBot in her classroom, McGowan could tackle real-world problems, inspire STEAM creativity, and prepare her second graders for future innovation.

Embarking on New Learning Journeys

It's not unusual for teachers to be nervous about successfully integrating 3D printing into their curriculum. "At first, I was like, 'You want me to do 3D printing with my second graders?' I wasn't quite sure how we were going to do that," she says. McGowan attended a MakerBot training at the STEM Education Office in the U.S. Army Armament Research, Development, and Engineered Center (ARDEC) at Picatinny Arsenal—a center dedicated to providing support for the education of tomorrow's STEM leaders. She also explored MakerBot's collection of free 3D printing resources to become more familiar with 3D printing. After training and learning more, McGowan was ready to advance her curriculum with MakerBot.

One great resource that McGowan can tap into for future lessons is Thingiverse Education. There, educators can access over 100 free lesson plans and connect with other educators for feedback, tips, best practices, and more. It makes advancing a curriculum with 3D printing easier than ever before.

Diving Into New Classroom Adventures

McGowan created a full 3D printing lesson plan for her second graders. She introduced them to 3D printing by asking them to create nameplates on Tinkercad. "They just had to bring in a text box and squish it down. I had them conform to exact dimensions, and then use the Text tool to put in their names and layer that on top. I specified the heights of both the box and the letters," McGowan recalls. She checked each student's nameplate for accuracy before sending the files to print. "They enjoyed putting their names on the plate, and choosing which fonts and styles to use," she says.

Once the students felt comfortable designing with Tinkercad, McGowan challenged them with a 3D printed pie chart project. "We had just done a big Excel survey of their eye colors in class," she says. They used this data to create a 3D pie chart in Tinkercad, with each piece representing the survey's results. "They learned how to take a basic shape and change the arc," she says. McGowan did the statistics for them, but it was each students' responsibility to alter the shape to reflect the data. They were asked to add numerical digits to each 3D model to represent the values of each piece. Finally, they had to format the font that would appear on each final pie piece. The tasks involved in this project aligned with New Jersey Common Core 8.2 standards, making them easy to incorporate into McGowan's general STEM curriculum.





Ms. McGowan and a student design pie charts in Tinkercad.

McGowan's classroom also had early access to the MakerBot Replicator Mini+. Backed by over 380,000* hours of testing, the Replicator Mini+ is engineered to provide portable desktop 3D printing that's faster, quieter, easier, and more reliable than previous models. Because it's portable and easy-to-use, The Replicator Mini+ is a great addition for classrooms that cater to younger children like those in McGowan's class.

A Perspective Students Appreciate

McGowan believes that the 3D printed pie charts create a lesson that results in both short term and long term benefits. McGowan believes that a 3D printed object provides students with a greater perspective of the data they're analyzing. "By taking their data to manipulate the shapes, they're turning it into an actual, tangible 3D object, which gives them more of a perspective than just seeing a flat, 2D circle," McGowan shares. Younger students retain more concepts when they're engaged through sight and touch, so the physical pieces of data provided a more immersive learning experience that they're less inclined to forget.

In McGowan's classroom, you'll find a poster that says "Life is About Making Mistakes and Learning From Them." It's there to remind students that failing at something is simply an opportunity to learn, grow, and try again. When the students first used Tinkercad, some encountered flaws in their designs. McGowan showed the mistakes to the rest of the class and taught them all how to fix

* To ensure reliable, high-quality performance, MakerBot Replicator+ and Replicator Mini+ Printers were rigorously tested for 380,000 hours across multiple facilities.

them. “It was interesting for them to see some of the mistakes,” McGowan says. Hoping to make a perfect 3D model, the students were motivated beyond failure and eager to try again.

Students also have the chance to get a deeper insight on 3D design mistakes using MakerBot Print. It’s Print Preview feature gives users the opportunity to play animations that reveal exactly where issues might be in their prints. Once students finish correcting their mistakes, McGowan could easily use MakerBot Print’s Auto Arrange feature to place multiple projects on various build plates, and save time by printing them all at once.

Lessons that Last a Lifetime

McGowan’s students are enjoying learning adventures that will follow them long after their time at Nishuane Elementary School. 3D design and 3D printing skills are already valued resources in industries like engineering, medicine, architecture, art, design, and more. “3D printing is really becoming part of the way we manufacture things,” McGowan says. “When they get older, there’ll be much more emphasis and exposure to it. So, exposing them while they’re still young gives them a better foundation.”

With one or more MakerBot 3D Printers in every Montclair public school, McGowan’s students are set to experience more in-depth 3D printing as they move from one grade to the next. They’ll go on to explore their ideas using iterative development and collaborate with their peers to make them even better. As their design skills develop, they’ll be eager to share their designs with the wider 3D printing community on Thingiverse. They’ll enjoy their own breakthroughs and continuously pursue better methods. Each step up will be bigger, more challenging, and more rewarding than the last.

Using MakerBot, Donna McGowan and other Montclair educators are sparking the fuse of lifelong curiosity, exploration, and experimentation for tomorrow’s STEAM innovators.

About Montclair Public School District and Nishuane Elementary School

New Jersey’s Montclair Public School District is on a mission to empower students with valuable STEAM skills that’ll reach far beyond the classroom. With a generous donation from local benefactors John and Judy Weston, the school district had accumulated the funds needed to install at least one MakerBot 3D printer in every school in the district. With MakerBot, Montclair educators have a full set of 3D printing solutions needed to make an impact and prepare their students for the jobs of the future.

Montclair’s Nishuane Elementary, a Title I school, was a proud recipient of a MakerBot Replicator 3D Printer. Title I is a federal initiative that provides financial assistance to schools that have students from low-income areas.

