Augmented Reality Sandbox Becomes Reality for STARBASE Martinsburg

When STARBASE Martinsburg instructor Ashley Spies came across an AR sandbox on the internet three years ago she knew it would be an asset in her classroom.

STARBASE, located at the 167th Airlift Wing, is a Department of Defense funded national program with a mission to inspire youth in STEM related fields. STARBASE Martinsburg’s AR sandbox allows users to create topography models by shaping real sand, which is then augmented in real time by an elevation color map, topographic contour lines, and simulated water according to the developer’s website.

The system teaches geographic, geologic, and hydrologic concepts such as how to read a topography map, the meaning of contour lines, watersheds, catchment areas and levees.

“We teach mapping and topography and it’s hard for students to fully understand the concepts when they are looking at two dimensional maps,” said Spies.

She and the other STARBASE instructors were using stacked cardboard cutouts that they made to teach the lessons.

Spies initially approached STARBASE Martinsburg program director Sherra Triggs about building an augmented reality sandbox after seeing a video online from the program developer, Oliver Kreylos, an associate researcher at U.C. Davis.

Triggs said she could not justify the cost at the time with their budget.

But Spies didn’t give up, and continued looking for avenues to get an AR sandbox in her classroom.

When she received an email last fall about a grant from the Governor’s STEM Initiative, part of the West Virginia Department of Education and the Arts, she knew that could be the answer to funding the AR sandbox.

Spies worked with fellow STARBASE instructor Seth Miller to complete the application for the grant which is designed to support STEM programs, projects and events serving West Virginia students from Pre-K through high school.

The grant was approved and STARBASE received enough money to purchase a computer, projector, depth sensing camera, stainless steel utility table,
sheet metal, sand and a few other miscellaneous items to build the system. The software was free to download under the GNU General Public License. Triggs knew there would be some aspects of the project that would be out of the scope of capabilities of her staff so she solicited some advice from Maj. Christopher Tusing.

“Tusing was vital part of the process,” Triggs said, adding: “he knows the capabilities of the people that work at this base and he put me in contact with ones who could help.”

One of those that helped was Staff Sgt. Doug Miller, a 167th aircraft structural maintenance craftsman. STARBASE provided some photos to give him an idea of how other AR sandbox systems were assembled. After a few mock-ups and some trial and error, Miller decided on a streamlined design. “And that’s when we started bending metal,” he said.

Miller put his fabrication skills to work to build the sandbox and a support system to hold the camera, projector and monitor at just the right distances above the sandbox. He also made a lid for the box to help with transport. He manufactured the entire piece by hand.

Miller said that he worked on the project for about a month during downtime between his normal aircraft projects. He also used the project to train one of the newer members of his shop.

Tech. Sgt. Alex Whalton, a client systems technician for the 167th Communications Flight, applied his coding and programming skills to install the software.

“The advantage to being in Linux is that someone could code other features into the program,” explained Whalton who also has a career in virtual reality. Triggs and her staff had a luncheon to show their appreciation for those who helped with the project.

“This solidifies the importance of the partnership we have with the base,” Triggs said.

The AR sandbox was up and running just in time for the STARBASE Kids Camp, a STEM focused day camp offered to children of those working at the 167AW.

According to Triggs, for now the sandbox will be used as a supplemental activity for students attending STARBASE. However, the national STARBASE curriculum is being updated to include a virtual reality component that would allow the team to use the AR sandbox in regular lessons.

The teachers are just starting to learn the potential applications for their sandbox.

For example, the system can simulate rain.

“This is a tool that could be used to explain the recent floods in the southern part of the state,” Triggs said. She explained how moving the sand to form mountains and valleys and using the rain feature could show how and why the water moved the way it did.

“It’s a great interactive tool that touches on all aspects of STEM,” Triggs said, adding “and as STEM moves into STEAM adding an Arts component, that touches on that also.”

According to Triggs, the biggest lesson they’ve learned so far from this project is to not give up on your goals just because you run into obstacles.

“That teacher drive in Ashley just pushed her to keep looking for ways to make this a reality; that’s a lesson we can all use,” Triggs said.

Source URL: https://dodstarbase.org/articles/augmented-reality-sandbox-becomes-reality-starbase-martinsburg