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On the waves with science

Jan 11, 2013

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In an effort to protect their boats from tsunami waves, Duniway Middle School sixth-graders built some massive docks from Lego blocks. Some had three flat sides; some had sides that curved; some had roofs while others were open to the air.

“We’re trying to make it as strong as we can,” said Ian Huffer, as he worked with Trevor Wertz and Alex Toro to create one of the docks.

Trevor noted, “It also needs to be high.”

Finished with the U-shaped construction, the boys carried it to the edge of the wave pool at the Evergreen Wings & Waves Waterpark. Other teams from their class lined up their docks as well.

Then the waves came. The first one barely moved the docked boats.

The second, as is common with a series of tsunami waves, was much stronger. It capsized several boats and dumped their cargoes.

As the waves continued to smash into the Lego structures, loose blocks tumbled into the surf.

Ian, Trevor and Alex’s dock lost its entire front wall. Their boat and its cargo washed away.

Under the instruction of Tim Morris, an educator from Evergreen, the sixth-graders tried again.

“Thicker walls this time,” Alex suggested, as he, Trevor and Ian doubled the number of blocks shielding their boat. They tied its mooring line more securely as well.

They set the dock at the edge of the wave pool and turned it at a 45-degree angle so the water would hit a corner, rather than a flat surface. When the tsunami returned, the waves wobbled their boat and shifted its cargo, but caused little damage.

“Yes! Yes!” Ian cried, jumping up and down.

All of Duniway’s sixth-graders went to the water park this week as an extension of their science lessons.



Marcus Larson
Ian Huffer, Alex Toro, Jonathan Mimila Suarez and, not shown, Trevor Wertz and Zane Fodge, incorporate diagonal cross pieces in their cube-shaped structure to give it more strength



Teacher Guy Duncan said the field trip, paid for by the McMinnville Education Foundation, afforded students real-world experience with waves.

They've been learning about waves, tsunamis, water pressure and water in general in their classrooms. But it's one thing to read about waves; it's another thing — with much more impact — to feel them, see them and watch them destroy a Lego dock.

“And they get to have a little fun,” Duncan said.

It's great to have the Evergreen Waterpark and its educators so close by, he said. To have the same kind of real-world experience without it, students would have to bus to the coast, which would cost a lot more for transportation and expand a great deal of educational time. Or they could go to the wave demonstration pool at Oregon State University, which also would take more time and money.

The OSU pool is designed for research, so its waves move more slowly. It doesn't capture sixth-graders' attention the way the wave pool at the water park does.

In addition to seeing a miniature tsunami in the wave pool, the sixth-graders had two more lessons at the water park.

At one station, educator Jenna Halsey taught them more about the science of waves.

Students learned about the crest and trough, or top and bottom of a wave, and about wave length, wave height and amplitude. Then they lined up, held hands and demonstrated those new vocabulary words — an exercise somewhat similar to a crowd doing “the wave” in a football stadium.

A tsunami is a series of those waves, Halsey said.

Tsunamis are usually caused by earthquakes, when the earth's plates slip and grind into different positions. They also can be started by underwater landslides or, occasionally, a meteorite splashing into the ocean.

The starting point of a tsunami doesn't see much action, Halsey said.

The energy moves outward in a circle, sending a series of waves in every direction. As the waves reach shore, they slow and build up, creating a wall of water that crashes into the shore.

If a tsunami is coming, she said, head for higher ground. “If you're on the coast and you feel the earth move, don't wait until you hear the sirens. Just go,” she said.

Students knew why: They had studied the destructive 2011 Japanese tsunami and learned what damage it could cause.

“What do you think of when you hear the word ‘tsunami’?” Halsey asked them.

“Big huge wave. Crazy. Destructive. Boom. Powerful,” sixth-graders answered.

At the third station in the water park, the Duniway students had a chance to engineer and build a structure related to a more gentle use of water — a tower designed to hold a container of water above ground, so it would flow to homes through the power of gravity.

Sixth-graders worked in teams to build towers from straws and tape.

One team started with a tall, four-sided pyramid featuring a water container perched at the very top. But they ran out of material, so the reservoir tipped and fell when water was added.

Instructor Robert Jordan said the design was good, as triangles are strong. But even the best designs don't work if you run out of materials or funds and are unable to complete them.

Another group created a trio of towers, each with a triangular base. Together, the three towers cupped the water reservoir.

It also collapsed because it wasn't quite complete.

The third team built a cube, then reinforced it with diagonals and straight cross pieces. It held up the longest, but eventually fell because one wall of the cube had less bracing.

Next time, students said, they would include more diagonals and triangles — and they would make more judicious use of their materials.

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