By Kelly St. John Regier

This summer, think 'STEM'

Science educator Sue Neuen gives parents practical advice to boost summer learning.

As director of the nonprofit group Science@OC (**scienceoc.org**), Sue Neuen works tirelessly to promote scientific literacy for all of Orange County's children. Her advice for parents who are staring down the dog days of summer wondering what they can do to boost their children's learning is simple: Think "STEM."

STEM is an acronym for the fields of science, technology, engineering and mathematics. Educators and policymakers like Neuen believe that American children need more opportunities to participate in hands-on science to develop the scientific literacy they need to compete in college and beyond.

"When they do forecasting of job growth, most of the well-paying jobs that will be available are in the areas of STEM," Neuen says. "I don't think any student is going to be able to compete if they don't have a grounding in the STEM subject areas. Our economy is based on innovation, and that's what we have to prepare our kids for. We need them to be critical thinkers and innovators."

So what kinds of activities can families do to promote STEM competencies?

From science camps to robotics classes, a variety of structured programs throughout Orange County nurture children's interest in engineering and science during the summer break. In addition, day trips to sites such as the Discovery Science Center, the Ocean Institute, the Santa Ana Zoo and local nature preserves are also good options.

But summertime is also the ideal chance to give children the kinds of unstructured play activities that allow them to teach themselves about the natural world. To spark a child's interest in STEM fields, Neuen advises that parents start by getting their kids outside to let them observe the natural world and start asking questions.

"The closer that a teacher or parent can get a student to first-hand, primary source learning, the better," she says. "They can do this all summer long."

For example, Neuen says that her fondest learning memories come not from a classroom, but from the fun summer family canoe trips during her childhood in Wisconsin.

"Talk about getting to know your world!" she says. "We slept under the stars and got to know the river currents. We really got close to nature and had to learn how to keep away from mosquitoes and keep dry when it was going to rain."

Neuen recounts her adventures and some of their most important lessons, such as how to start a fire with wet firewood.

"For me, those were real learning experiences," she says. "I remember one summer, nobody stopped us kids from making a raft from green wood. They knew it wouldn't float, but we didn't. They didn't tell us it wasn't going to work because green wood is too heavy. They let us figure it out ourselves."

Neuen also encourages parents to expose their children to engineering by helping young kids explore how the everyday objects they use are made. In her case, that meant taking apart a lawnmower with her father.

"There isn't any course in elementary or middle school that says, 'This is what engineering is,'" Neuen says. "Everything we touch has been engineered. Parents can help their kids to break apart something that has been engineered and see, 'What are the pieces? How are they developed, and where did you get it?'" Neuen says.

For students in the upper grades of elementary school and beyond, one option is exposure to robotics, LEGOS and engineering/design challenges.

"Challenge them to see if they can build a tower with just spaghetti and marshmallows that's strong enough to hold

a heavy book or a grapefruit," Neuen suggests. "Engineering challenges are just exciting to see if you can do it."

For young children, a great board game to play is Chutes and Ladders. Along with being fun, it helps them to learn the linear importance of numbers.

"Parents with young kids should know that it's so important to give their children a grounding in mathematics," says Neuen. "A young child's ability in math is more of a predictor of how well they can do in school later on, even more than learning to read. Your preschooler can count from one to 10, but do they really understand that six is more than four?"

Getting the littlest children heading on the path to success in science starts with simple activities, such as getting down on the ground to discover a snail, or going to the beach, where they can dig in the sand. As children enter elementary school, Neuen encourages parents to take them to an arboretum, botanical gardens and nature trails.

Challenge them by creating scavenger hunts, or have them collect as many different kinds of seeds or leaves as they can find. Stimulate their minds: Ask them why some seeds have hard shells or how they think different seeds travel.

As children get into the older elementary grades, they like to design and make things. This can also be a great age to get them into the kitchen, since chemistry and math are integral parts of cooking. For instance, baking is a great way to demonstrate the importance of proper measurements, and children can see the immediate effects of the chemical reactions. If you don't use correct ingredients and ratios, your cake will likely be a flop.

"Another fun one to explore is force and motion," Neuen says. "How do cars and skateboards go? Why did they design things a certain way?"

When children ask "why questions," Neuen suggests the best way parents can answer is by sparking their interest with something like, "So, how do you think we could find out?"

Parents have an obligation to observe their kids and really listen to them.

"If your son or daughter is really interested in insects, ask, 'Would you like to get a microscope so you can see them better?'" she says. "Parents have to be particularly wide-eyed and big-eared to find out what their kids' interests are and help them to develop them."

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