

Kiddie Chemistry

When he was four years old, Marty Burke collected bottle caps. His family lived across the street from a liquor store in rural Carroll County, Maryland, and he fulfilled his early analytical leanings by lining up Moosehead and Pabst caps according to whether or not they were bent.

"I realize now that they were his models for molecules," says his mother, Mary Ellen Burke, who runs a preschool called Little People's Place.

So that other children in Carroll County don't have to resort to bottle caps, the two Burkes have collaborated to make chemistry larger than life for the toddler set.

Burke, an HHMI early career scientist, designs molecular prosthetics—molecules engineered to replace missing proteins in diseased cells. On a visit to his lab at University of Illinois at Urbana-Champaign, his mother saw the ball-and-stick models chemists use to build 3-D molecular structures. They reminded her of the Tinkertoys her preschoolers love. So she pocketed one to teach her students about her son's job as a chemist.

To set her back on the straight and narrow, Burke found a giant molecular model set for sale online and knew he'd landed on the perfect Christmas gift: "The models, with balls the size of softballs, get bigger than the kids really quickly," he says.



But how much chemistry can a preschooler really learn? Mary Ellen Burke, aka Mrs. Mary, has been operating her school for 34 years on the premise that children are little people who, given the chance, can outlearn any adult. In addition to reading, writing, and math, her curriculum has always included Spanish, sign language, social awareness, and the scientific method—long before they were trendy in child development circles.

"Kids are like giant sponges—if you make it interesting, they can learn anything," she says, adding, "I've always said, 'If they can learn bad words, they can learn big ones.'" Mrs. Mary built an entire curriculum around the synthesis of molecules, using the giant models as well as fashioning edible molecules out of colored cookie dough. She also relabeled crayons, so red became oxygen and black became carbon.

When Mrs. Mary and the kids got bored with building simple molecules like water and carbon dioxide, she called her son for more ideas. Claiming

to be busy saving the world from missing proteins, Marty sent her *Molecules That Changed the World* by chemist K.C. Nicolaou. The book starts with the first molecule ever synthesized: urea, an immediate hit.

"If you can somehow work 'pee' into the conversation, that's instant success with preschoolers," says Marty, who grew up in and worked as a teenager at Little People's Place.

His mom hopes her efforts will set the stage for her students to follow through on an interest in science later in life. When she recently asked five-year-old Ben Weller what he remembered about the chemistry lessons, he said, "Mrs. Mary, when I went to kindergarten they made me put all this stuff in my head, and your stuff fell out!" But when she pulled out the Nicolaou book, he flipped to the right page for building urea, grabbed the giant stick and brightly colored balls and got down to some serious play. —Kendall Powell