

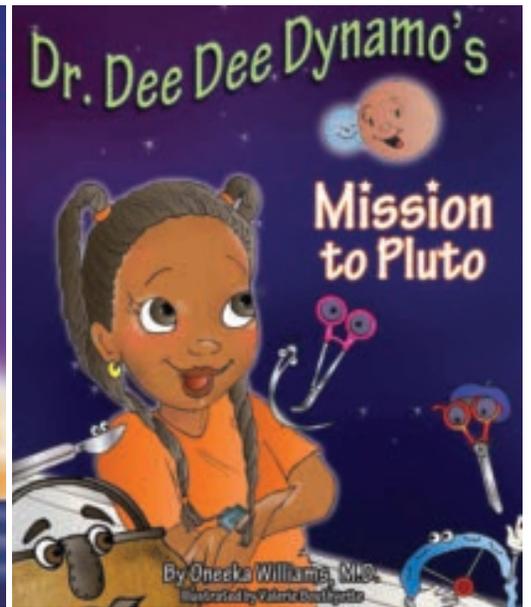
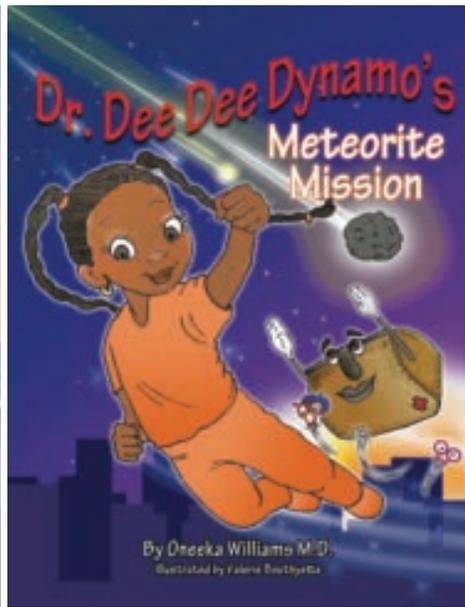
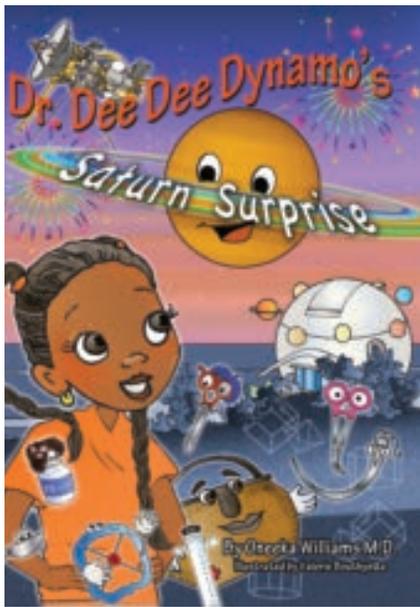
Embedding *the* Medicine *in the* Brownie

A model for early science education engagement.

< Dr. Dee Dee Dynamo is a girl SUPERHERO who is a caring, dynamic, energetic, positive, powerful, spunky super surgeon who believes she can do anything! She heals with her hands, brings surgery and science together, and loves her family. She encourages kids to live a life without limits.

By Oneeka Williams, MD, MPH

How can the US performance in Math and Science be improved? The 2012 test scores of the Program for International Student Assessment (PISA) showed that US students were average for Science and below average for Math when compared to 70 countries worldwide. The gap is even more significant for Blacks and Hispanics and translates into inadequate numbers of underrepresented minorities entering STEM careers. Also of concern is underrepresentation of women in STEM careers. All of the above have adverse effects both domestically and globally.



There have been numerous initiatives, by both the federal government and private sector, to address this issue with mixed results. There are multiple contributors to the problem: (a) the relationship of socioeconomic status on resources available to communities, families, schools and teachers; (b) the existing stereotypes around what a scientist looks like that impact how students view themselves and how educators interact with students; (c) the lack of mentors, role models and support in academics and industry that establishes a sense of isolation. However, I submit that early engagement with science can create a framework that establishes connections to science in an organic way. This creates experiences that pull children into scientific inquiry, sparking their curiosity, thereby stimulating them to ask questions about the world around them. The mindset that results can shape a way of life.

Clinical psychologist Jean Piaget proposed that children are responsible for building their own knowledge and develop ways of thinking based on early exposures and interactions with their environment. This creates the building blocks for continued learning and knowledge. These 'schemas' become more complex as children develop and are essentially the same dynamic that allows babies to recognize their parent's voice and acquire language skills. Similarly, early developmentally appropriate exposure to science, promotes an affinity for and understanding of science that builds towards positive attitudes about Science. Therefore, it is possible

that overall attitudes towards science and prospects for a lifelong career in a STEM (Science, Technology, Engineering and Math) field can be shaped at an early age.

WHAT DOES SCIENCE ENGAGEMENT LOOK LIKE DURING THE EARLY CRITICAL YEARS?

First, we must make science relevant and exciting for children at an early age while crafting its importance to resonate with their developmental levels. I contend that one very effective way of connecting kids to science early, is to embed science in a storytelling narrative. This achieves several objectives. It links reading as the foundation of expanding horizons. It underscores the importance of early reading as a mechanism to build tools of scientific literacy- critical thinking, integrated learning and processing. Early reading builds imagination and fosters connections between creativity and innovation while at the same time introducing children to science content.

Second, our children must be conscious of real world challenges and internalize that they are part of the solution, without becoming hyper-anxious. Thus, our charge is to introduce a narrative around these challenges in a way that is neither daunting nor heavy, but rather engages them in a non-threatening way.

Third, because one of the ways that children develop is by copying behaviors, we must create images that model problem solving in science, expand the images of who is solving problems and attach the greater good that comes out of these endeavors.

Dr. Oneeka Williams, a Museum of Science Overseer, is a top-rated urological surgeon conducting a busy practice at St. Elizabeth's Medical Center in Boston and serving as an Assistant Clinical Professor of Urology at Tufts University School of Medicine. She earned Medical Doctor and Masters of Public Health degrees at Harvard Medical School. She is passionate about community health and community service and is a frequent speaker about prostate health and cardiovascular health. She has had a lifelong passion for writing and is the author of the Dr. Dee Dee Dynamo children's book series designed to empower girls and minorities around STEM. Born in Georgetown, Guyana, South America, her family relocated to Barbados when she was 10. She and her husband—Dr. Charles Anderson, a neonatologist, hospital management specialist, and corporate executive—and their son, Mark, live just outside of Boston.



Finally, engagement is a family affair. We must create a construct that activates and invites families to make exposure to science a priority and have the resources available to facilitate that exploration.

A MODEL OF EARLY SCIENCE EDUCATION AND ENGAGEMENT

Imagine pulling children into an adventure of the discovery of Penicillin by microbiologist Dr. Alexander Fleming. Imagine personalizing the villain colonies of bacteria *Staphylococcus Aureus* (*Staphy*) that are trying to take over Dr. Fleming's lab while he was away on vacation. Imagine a very shy but nosey mold, *Penicillin Notatum* (*Penny*), creeping into the lab to see what was happening but none of the bacteria would come close to her. Why wouldn't *Staphy* come near *Penny*? Does she have a horrible odor? Dr. Fleming returns to find a very sad and lonely *Penny* but discovers that the chemical that *Penny* produced, which kept *Staphy* away from her, saves lives. Imagine the triumph of that moment! *Penny* becomes a hero and because Dr. Fleming paid attention to what was happening around him, the extraordinary discovery of Penicillin was made. This changed the history of medicine.

This is merely one example of the many opportunities to engage children on the history of amazing scientific discoveries—how simple observations and questions can lead to life-saving discoveries; how science is always at work around them; how they too can make a difference. A simple

story that introduces them to science concepts, sparks interest, encourages them to explore and ask questions while simultaneously delivering a history lesson!

A more contemporary example of how the storytelling narrative creates a platform for exploration and takes children on a journey from the impossible to the possible is the story of Pluto and the Space Probe. Rewind to 2013 when the girl super surgeon *Dr. Dee Dee Dynamo* first appeared on the scene and jetted off to Pluto in her flying ambulance to try to restore the dwarf planet, Pluto, to planet status. At that time, this was fantasy, as no craft from Earth had ever made it to Pluto. Fast forward to 2015 when NASA's New Horizons Space Probe arrived at Pluto. What unfolded for kids was a true demonstration that nothing is impossible. A dream and a vision can come to fruition if accompanied by scientific discipline, perseverance and patience. These are not only learning opportunities for our children but seeds that are planted which inspire them about how they can engage with the world around them.

These are some of the benefits of early science education. It takes a form which allows for a rich intersection of imagination, fantasy, reading, science and family engagement that result in children building knowledge around science and developing a lifelong interest and philosophy about learning without even knowing. This equates to ingesting the medicine that is good for you hidden in the yummy brownie and experiencing the lasting benefits thereafter!