Written Testimony:
Mrs. Brenda Conwell-Dudley
Before the House Science Committee on
"STEM Education in Action: Learning Today…Leading Tomorrow"
June 16, 2011

Good morning to members of the committee and to all of the finalists, teachers, mentors, and organizers of the Toshiba/NSTA ExploraVision National Science Competition. On behalf of our sponsoring school, the Virginia Virtual Academy, our coach, Mrs. Penni Harrison, and our team, I would like to thank the Committee on Science, Space, and Technology for inviting us to this hearing. This is my second year as an ExploraVision science team mentor for the 4th through 6th grade age group; I mentored a regional winning team in 2010, and I am a mentor for the first place winning team in 2011. I would like to describe my motivation for participating in ExploraVision's program.

I heard about ExploraVision from a mother at one of my son's flag football practices, in the fall of 2009. Her son, Joshua, a player on the team, was critically allergic to many foods and much of his surroundings. He had flat-lined in an emergency room that summer, and had been brought back to life using intubation without anesthesia after one particularly bad allergic reaction. Joshua was nine-years-old, and he was being treated at the National Institutes of Health (NIH) in Bethesda for his condition. While receiving treatment at the NIH, Joshua met another young boy with similar critical allergies. This second little boy was Colby Tomasello; Colby is a member of 2009 ExploraVision second place national winning team and he and his team mates designed an EpiWatch – a small, wearable, computerized watch that contains special codes and micro needles that instantly deliver painless doses of epinephrine when the wearer suffers from an allergic reaction. The EpiWatch utilizes cell phone and GPS technology to alert medical officials in the event the wearer suffers a life-threatening allergic reaction.

After hearing about Colby's project, and after visiting the ExploraVision website, I was so impressed by what young children could invent that, if the opportunity ever arose, I promised myself that I would encourage my son to participate. Not more than a week later, his school posted a notice in the student newspaper that they would be sponsoring teams in the ExploraVision National Science Competition for the first time. I immediately asked my son about participating – he agreed and proceeded to invite three of his friends from the 5th grade to join. Jack's 2010 science team designed a food poisoning detection device that looked like a thumb drive, was light weight and portable, and could be used to detect dangerous pathogens in food. This year's team designed a military helmet to protect soldiers from traumatic brain injury from roadside bombs. I am a huge fan of ExploraVision's science competition, a contest that encourages children in grades Kindergarten through 12th to select a current technology and imagine what it might be like in 20 years. And I am continually amazed by the originality of the students' inventions and the great advantage to society that all of these ideas could potentially provide.

Now I would like to present background information on our team and more detailed information on our project for members of the committee. Our team is comprised of four students who came to know each other through swimming. All four team members swim year round for the nationally recognized Curl-Burke Swim Club and in the summer for the Old Dominion Swim League. As I mentioned, my son had been part of a regional winning team the year before, and in accordance with the rules of the competition, he was not allowed to compete with members of his previously winning team – nor will the children sitting with us today be allowed to compete together as a team next year, or ever again. My son has benefited greatly in this regard: his 2010 regional winning team was all male, and each of the four boys were in advanced math class together. This year's team is predominately female, and while all of these girls excel in math, my son's association with them is through sports. Suffice to say, successful teams come in all shapes and sizes.

Another important distinction with this year's team is that our four students represent three different schools; Jack was homeschooled using Virginia Virtual Academy's online 6th grade public school program, Abby Porter and Jovia Ho attend 5th grade at John E. Tolbert Elementary School in Leesburg, and Sydney Dayyani attends 6th grade at Belmont Ridge Middle School in Lansdowne. I would like to take a moment to thank Virginia Virtual Academy and Suzanne Sloane, who is the Head of the School, for sponsoring our team and for giving us an unparalleled opportunity to work together: male and female students, elementary and middle school students, homeschooled and 'brick and mortar' public school students. I'm a little biased, but I think our team represents the best of the collaborative spirit, and as we all know, collaboration in the field of science is how society will find solutions to the complex and very serious problems that confront us as a nation.

Starting last September, our team began meeting every week for 2 hours. The team read news articles and news magazines to become familiar with current events and advances in science and technology. The team brainstormed and discussed multiple ideas over several weeks. The team communicated with our coach, Mrs. Harrison, using Elluminate Live's web conferencing program. My son frequently used this program for his online schooling, and it proved to be a great resource for our science team too. Mrs. Harrison provided us with constructive and invaluable feedback every step along the way, and the team was always eager and excited to use the new communication platform to present their ideas to her.

Some of our team ideas included a stress releasing ball that would decrease workplace stress, a protective satellite shield to minimize space junk collisions, and a brain-powered car. With Google's announcement of a "Self-Driving Car" within the same time frame, the team realized how quickly the world around them was changing and how important it is to stay on top of the latest developments in science. And then Jack saw the picture of Spec. Robert Warren in the *Washington Post*. Spec. Warren is a soldier who has suffered traumatic brain injury from an IED while serving in Kandahar, Afghanistan in May 2010. Jack selected the idea of creating a helmet that would protect U.S. soldiers from traumatic brain injury due to roadside bombs with a device the team called the *HEADS UP! HELMET*. The team's design features overlapping polyethylene plates, sophisticated heat and air pressure sensors, bullet and shrapnel-stopping gels, and a 360 degree neck collar that inflates to protect the brain and neck in case of a bomb blast.

The team further decided that they would take the proposed technology from the battlefield to the playing field, in 20 years or less, to help prevent the growing number of concussions in children and athletes with a device call *HEADS UP! HEADGEAR.* This futuristic design features micro layers of impact-resistant, molecular weight polyethylene sheets spun and covered with highly sensitive temperature and air pressure sensors to detect concussive force. These impact-resistant sheets are also encapsulated with shock absorbing gel that expands to form a protective cushion; instant cold crystals provide metabolic cool-down to prevent intracranial pressure (ICP) build-up – one of the most dangerous results of TBI; and lavender or eucalyptus aromatherapy beads deliver post-impact sensory relief to prevent shock. These composite materials expand under force, extreme air pressure or temperature to ultimately protect the brain from mild, moderate or traumatic injury.

Our team used all of the research tools at their disposal, including conducting email interviews of doctors, engineers and researchers from across the United States – from the University of Washington in Seattle to the University of Maryland in College Park. Using interviews, the library and the internet, our team worked diligently to learn as much as they could about healthy brain function, traumatic brain injury and the science behind the state-of-the-art technologies surrounding helmet design.

The team's eleven page written submittal and five page simulated web designs documented the history and the present technology of helmet design, and included a detailed description of their future design, the scientific breakthroughs necessary to make their new invention a reality, and the future technology's positive and negative consequences. I'm proud to say, the team finished their submittal for the regional competition a full 3 weeks in advance of the February deadline.

As regional winners, the team was required to expand upon the work they submitted in the first phase in order to compete in the national competition: The team began working right away and they were back to meeting 2 hours every week, AND on the weekends! They began by building the prototype models. The team felt it was necessary to build a model of both their present AND future inventions in order to better explain their Helmet's design process. After the models were complete, the team worked to find the most compelling clips for their 2-minute video. They edited and practiced their parts to ensure the video would tell the complete story of their invention. The website is a compilation of all the work the team has done to date and provides a degree of user interface that makes the website educational and interesting. Once again, I'm proud to say, the team finished their final submittal for the national competition well in advance of the April 8th deadline.

The national winning teams were announced on May 2, 2011, and here we are. Our team has learned a lot about working on an interdisciplinary project. They have learned how to organize and present their knowledge more effectively, and, as a result, they have sharpened their communication skills. I am hopeful, that participation in this competition will ignite an interest for members of our team in STEM related fields, but I know they have, at the very least, developed a better understanding of the world around them. I'd like to thank the Toshiba Corporation for sponsoring the competition and the National Science Teachers Association for administering this event.

And on a tragic, personal note, I would like to offer our coach, Mrs. Penni Harrison, our deepest sympathy on the loss of her husband. We have collaborated with Mrs. Harrison since September, 2010, and in all of our team discussions regarding the design of our military helmet, we did not know, until six days ago, that her husband, COL James W. Harrison, Jr., was killed in action, in May 2007, while serving as the Corrections and Detainee expert in Afghanistan. We are very, very sorry for her loss, and we realize that our research, discussions and presentations may have revived painful memories for her - and yet she was always so kind, supportive, and positive when we presented our information to her. Mrs. Harrison truly exhibits the patriotic selflessness of the American military family. It is an honor and a privilege to have worked with her, and we could not have asked for a better teacher, coach, and role model.