

Remarks by the Honorable Ray Mabus  
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STEM Roll Out – Business Higher Education Forum  
Washington, D.C.  
10 June, 2013

I want to thank you all for being here. This issue, this discussion, ensuring that the next generation of Science, Engineering, Math and Technology graduates, and experts, and people in our society, there is no more important subject that you can get together for. I do want to say just a word about Admiral Klunder. I have asked what his first name was on our way over here, because I know him by his callsign: Gucci. He has been spectacular as the head of ONR.

I've been to talk with this group once before, and the last time I was here I talked about the "gathering storm" that is the current state of STEM education in the United States. We haven't been at this for a long time in an organized way, and it is going to take a period of really sustained, and concentrated, and dedicated effort to make sure that we succeed. But I think it's good, and valuable, and informative to go over some of the numbers again, and you're going to hear this I'm sure, over and over again. But then to talk about why Navy, why Navy and Marine Corps, why are we doing this?

Every year in the United States about 3 million people graduate from high school. Now that's too few, and it's only about 70% of those that start school, but 3 million get a high school diploma, walk across that stage and get a diploma. Out of those that go to college only about a third start in a STEM related field. Out of that third, only half will graduate with those STEM degrees. And out of that half -- I'm doing math in public -- we're getting smaller and smaller, a very small number will go on to get a Masters degree. The numbers tell us that out of every fifty

high school diplomas, we end up with only four STEM Bachelor's degrees and one advanced degree.

So for an example, something that is really important to us in the Navy is acoustics. In 2010, in the whole country we had seven bachelor's degrees, nine master's degrees, and five doctorates. That's in the whole United States. Now acoustics may sound like a pretty narrow and specific field, but it's really not. Just think about it. In the Navy it's how we hunt submarines, and it's how we keep our submarines safe. We do things with acoustics on, under, and over the sea.

Georgetown did a study that said 74% of our seniors in High School scored below "proficient" in math. So, three quarters of people that are about to graduate can't even reach the low bar of "proficient." And the United States measures "average" in STEM education when compared to the rest of the world. We all should never accept being average in anything, but particularly in something as important as STEM.

Because of the decline in public education and STEM education, fewer and fewer of our students are going into STEM. Now our universities are the envy of the world. But, more and more the students that are enrolled in our advanced programs come from somewhere else in the world than the United States. They come from India, they come from China. I did the commencement at Alcorn State University; that started as a black University in Mississippi; it's where a lot of our STEM students go in Mississippi. It's where Medgar Evers went to school. When I did the commencement, of the 30 summa cum laude graduates, over half were from Russia. In the entire graduating class there were over 100 students from Russia and they were all in STEM education.

Gucci talked about his family, and I can tell you a little about mine. My older two daughters went to the same school and they had a great science teacher in the 5<sup>th</sup> grade, I mean a great science teacher. Mr. Davis got them on fire about science. His daughter was a science teacher in the 6<sup>th</sup> grade, she kept it going. Then in the 7<sup>th</sup> grade they got the track coach who just happened to teach 7<sup>th</sup> grade science and it went downhill from there. Two great students, intense about science, technology, and math, they took calculus in high school and physics. My older daughter has a degree from Harvard in a big money field: history and literature. My middle daughter will be a senior at NYU this fall, is also studying a big money field: art history. But, it shows you how tenuous that connection is and how slim that reed is. It also shows how important it is for us not just at the university level but starting in middle school, starting when our students, our children, are getting interested in what they are going to do in life, to make that connection to science, technology, engineering and math.

So how come the Navy? Why the Navy and Marine Corps? Why should we care? Why should we be interested? Because it's a question that we get a lot, on this and other subjects. Why don't you let the Department of Education handle this? Why don't you let somebody else do this? Why Navy? Why should you be putting effort into this, why should you be putting some of your funds into this. Well, first, every single day our Sailors and Marines who are deployed worldwide, are the cornerstone of American defense and power and do incredibly difficult and very technical things. They operate and maintain the world's most advanced ballistic and guided missile systems, they operate and repair avionics on the most advanced aircraft, and they take submarines to the depths of the oceans. They run nuclear reactors on our subs and carriers and

they have a safety record that is second to none. You cannot ask for more technically demanding jobs anywhere.

In order to do them, and do them well, they've got to understand what these systems do and why they work, and that requires a strong foundation in STEM subjects. In the 21<sup>st</sup> century it is very clear that our nation's security is going to depend more on our smarts than on our strength. We become strong, in fact, only when we are smart.

I'll give you one example. The newest ship we have, the Littoral Combat Ship, has a core crew of 50, but it has far more complexity and technology than the ships we sailed a generation ago that had exponentially more Sailors. The ship I sailed on four decades ago had 1000 Sailors, a thousand people. That's because we had to have a Sailor to turn every valve, flip every switch, and today we don't. So what it means is that the generation of future naval officers and a generation of future Sailors and Marines are going to be called upon and command incredibly advanced ships, systems, and weapons. We don't have any requirement for strong backs and weak minds. There are no jobs in the military, or frankly in society, for that anymore.

We have to take a pretty long view about this. We build our ships to be in the fleet 30, 40, 50 years. We just retired USS ENTERPRISE last December in Norfolk, after 51 years of service. ENTERPRISE was in the Cuban Missile Crisis blockade. So the last Captain of the ships we're building today has not been born yet. Those ships we are building today are going to be upgraded, technology changes, and the people who run them whether it be the Sailors in the engine room or weapons department or the CO's are going to have to be flexible and

technologically way ahead of the curve. That requires a strong STEM foundation. At the Naval Academy even if you major in history or English, and I'm one of those that majored in English, not at the Naval Academy, at Old Miss, which has a pretty strong English Department, some guy named Faulkner flunked out. But they take so many courses in STEM, in the sciences, technology, engineering, and mathematics, that when they graduate it's a Bachelor of Science in English or a Bachelor of Science in History. That's the sort of background we've got to have, not just in the folks coming out of the Naval Academy, but all across this country, whether they're going to join the Navy and Marine Corps or whether they're going to do the second thing that I'm worried about and that's build the stuff that we're going to use, come up with the ideas, and be the innovators, the designers of the things that we need and going to have to have in the future.

Since the Navy sailed our first six frigates 200 years ago, we have been agile, we have been flexible, and we have been lethal. We've defended America. We have always been the most adaptable of the President's options. We push boundaries, new ideas and innovative solutions. Designing and building next generation of ships and aircraft, of weapons and systems, is incredibly demanding. It is an edge that we have enjoyed for decades. It is an edge that we absolutely have to keep. The two edges that we have had, the two things we have dominated in, are our people and technology. Those two come together in STEM.

But it isn't just about the military. Our economy relies and thrives on innovation. Tom Friedman wrote a book that came out a few months ago called "That Was Us Once," it's a great book. It talks about innovation, it talks about how we became the world leader that we are today.

In a conversation I had with him, which was interesting and he went on the Sunday talk shows a couple weeks ago and said the same thing, he said “I’m not worried about people stealing our cyber secrets that much. I’m worried if they steal our Declaration of Independence or our Constitution.” He said, if they steal the designs of how we do things it’s going to take them a while to reverse engineer it and we’re going to be on to the next thing. The important thing is that we not stop; the important thing is that we continue to innovate. The important thing is that we are always on that cutting-edge. Now he did say that he understands why the military needs to protect cyber secrets, and why our military partners needed to do that. But in the long run innovation beat it all, and I think he’s right.

Industry, the only continuous thing in industry is change, it is driven by new ways of doing things, and new ways of building things. Without enough people with STEM backgrounds, we quit leading the world’s innovation. The entire world wants their own Silicon Valley, or Route 128 in Boston, but without STEM and concentration on education we risk losing the ability to keep the Silicon Valleys in America, to keep the Route 128’s. More and more companies are looking overseas to find the skills, the engineers and scientists who will develop our future technology and advancements. We going to have to do a lot better with making these home grown.

In the past few years we have made a lot of progress in our Naval STEM programs. Wes mentioned the “STEM 2 Stern” Initiative: it is now four years old, and every year we reach more and more students. We’re reaching the end of Phase I of this program, last year our education

and outreach got an additional to 8000 American students involved, bringing the total involved to over 100,000 students that we are reaching directly with Navy STEM programs.

Earlier this year I signed out Phase II of our Naval STEM Strategy. Basically I've challenged the STEM organization, and ONR is up to the challenge, I'm absolutely confident, to get another 40,000 students in by 2015. We've awarded a dozen challenge grants and we had four research teams selected as award winners for our Digital Tutor Grand Challenge.

Later this year I get to go to Chicago and meet with Mayor Rahm Immanuel and talk about our Critical Midwest Association of Science and Service, MASS Program there. We've partnered with the City of Chicago, Chicago Public Schools, and City Colleges of Chicago on a five year program to integrate some of our most successful STEM learning models and work-study opportunities into 7 Chicago schools. The program will reach 1000 students in low income, disadvantaged and underrepresented school districts. One of the most important parts of this program is sort of what STEM is all about, and that is the metrics and evaluation plan that we will be using to measure success. Over time this will help us refine the programs and increase their effectiveness and increase reach.

My job is defined, as the Secretary of the Navy, to recruit, train, and equip Sailors and Marines of the Navy and Marine Corps. This effort is all about that but it is about a lot more than that too. We want to educate our future engineers and naval researchers; but we want to help educate America's future scientific leaders, future industry leaders, future educational leaders. I want to give you just one example of type of student I'm talking about.

I work in a building that is sort of obsessed with acronyms and abbreviations. In fact, one of the things that I did when I came into my job and was being briefed up, I started asking people what the acronym meant or the abbreviation meant, about half of them didn't know. I have 4 P's: People, Platforms, Power, and Partnerships. Power is energy, how we get it, how we use it, how we can turn it from a liability into an advantage. One of the things that we've worked on is biofuels. We've worked at the direction of the President with the Departments of Agriculture and Energy and Navy. And on Memorial Day weekend we just announced that we have signed agreements with three private sector companies, who by 2016 have committed to producing 150 million gallons of biofuel at less than \$4 a gallon. Now that is pretty revolutionary. This was the result of the President saying: do a nationwide biofuel industry, make it cost competitive, and private sector has to share the costs. Every one of these things we've done, the private sector has at least a one -to-one match.

I proud of this, but the example I'm going to give you is a young woman who was in my office a few weeks ago named Sara Volz, from Colorado. She is 17 years old, and she has done some groundbreaking work, at seventeen, developing algae that can be used to make biofuels. Now she did this in a high tech lab...she grew the algae under her bed in her bedroom. My children have tried that too, although not intentionally and they usually tried in the refrigerator.

In 2012, when she was 16, she received a \$50,000 grant to research algae and its potential for biofuel. She's been researching how to increase that potential through "stress-induced lipid accumulation." Now, I have exhausted my knowledge of that. This year, the reason she was

here, she won the Intel Science Talent Search, went to the White House, met the President and talked about her research.

She's the exception. But she shouldn't be. She should not be the exception. She should be the rule. She said at the White House, she said, "My school really doesn't do anything with this." She reached out to Colorado State University and the Air Force Academy to do this sort of research. It should be able to happen at high schools. This sort of cutting edge thinking and innovation ought to be in high schools, colleges, and universities all around this country.

But we've had a sort of slow decline in basically K through 12 education in this country. My Dad, who was born in 1901, in the same town I was, Ackerman, Mississippi, a town of 1000 people. He became a civil engineer because he fell in love with STEM education and the preciseness of it. In high school, in Ackerman, Mississippi, he took physics and he took chemistry, but by the time I came along 50 years later we didn't have any of that. So very few of my classmates went into the things that my Dad and his classmates did. Just as that decline has been slow and long, the road back isn't going to be fast. But we've got to do it. We've got to do it every single day and every single year.

This year we're putting \$55 million from the Navy into STEM programs. Now in a time of budget crunches and crisis, they say "well, why are you doing this." There is no more important thing to do. There is no more crucial thing for America's future than this. Money alone can't be the metric. Our definition of success is if we reach a broader audience, if we have STEM graduates, if we have those high school students still inspired by and interested in STEM, then

we have succeeded. We are monitoring all our programs, checking up on the students that we worked with, and we're working to make sure they stay on this path and they commit themselves to it in college and beyond.

We've got a lot of support, including President Obama who is very vocal about it. This "1 million new STEM" mission that the President laid out is an ambitious goal, it's over the next decade, but it's very doable but we're going to have to do it together. The Navy's not going to be able to do it by itself, ONR is not going to be able to do it by itself, industry in America is not going to be able to do it by itself, the education system is not going to be able to do it by itself, but together I'm actually pretty confident that we can do it. That is why ONR has funded the studies that developed the STEM Undergraduate Model which you'll be rolling out here today. Together we can develop the best practices, most effective investments, and focus our ability on how we do this.

And return to the young woman, Sara Volz. She summed up, at the White House, everything pretty well. She said, "Science is a philosophy, it's questioning the world around you. It's not just a collection of knowledge. Every child is born a scientist. We're all born with this curiosity about the world and that's what schools should emphasize."

That's a pretty wise young woman. She should not be the exception. She should be the rule. By working together we can make sure we get done. I go back to what I said at the beginning, the United States, particularly in education, should never accept, ever, being average in anything. We lead this world in innovation, we lead this world in the way we think, we lead the world

because of our ideas. It's going to be required to maintain the United States Navy and United States Marine Corps as the most powerful expeditionary fighting force the world has ever known. It is what's going to be required to maintain the United States as the leader in this world of everything.

So from the Navy, Semper Fortis. Forever Courageous.

From the Marine Corps, Semper Fideles. Forever Faithful.

Thank you.