

**The North Country Region public hearing for the  
New NY Education Reform Commission  
Tuesday, August 28, 2012 - Lake Placid, NY  
President Anthony G. Collins, Clarkson University**

Good Afternoon. I am Anthony G. Collins, President of Clarkson University and co-chair of the North Country Regional Economic Development Council as well as the past chair of New York's Commission of Independent Colleges and Universities and the chair-elect of the National Association of Independent Technological Universities. In addition, I serve on the boards of the CenterState Corporation for Economic Opportunity, the NYS Business Council, and the Syracuse Center of Excellence in Environment and Energy System. I am also the president of the Seaway Private Equity Corporation that invests in new technology companies based in St. Lawrence County, New York, and serve on the board for (TSEC) The Solar Energy Consortium, which mobilizes related resources in New York State. I have been and continue to be a strong advocate for education - industry partnerships, particularly in the STEM fields, and understand the challenges faced by both sectors in our global economy as well as the mutual benefits that can be derived when the two work together. I shall focus my remarks on the current status of education and the workforce, the vision for the North Country, and efforts or solutions to bridge the gap between the two.

The North Country Regional Economic Development Council's plan is titled "Transformational" because that is the essence of the vision that our community leaders have for the North Country and it embodies the process that will assure New York State regains its status as a leader in innovation. Old ways of doing business, outdated methods of communication and traditional educational practices will not prepare our students to be competitive in the global marketplace. We need to rethink how we are preparing today's youth for the challenges that they will face in this 21<sup>st</sup> century. We - as a community of practitioners - need to transform their educational experiences today so that they have the skills, both technical and cognitive, to take their rightful place as leaders tomorrow.

Numerous reports generated by the private business sector and the government, including those by the President's Council of Advisors on Science and Technology (PCAST) have articulated both the need for STEM graduates and the essential skills needed by today's workers and those of the next generation. Over the next decade, approximately one million more STEM graduates are needed to meet workforce demands. Since the Commission on Achieving Necessary Skills (SCANS) Report in the early 1990's to the present, there has been and continues to be overwhelming consensus that these essential skills can be categorized into three broad areas: Information Processing and Technology, Thinking and Problem Solving, and Interpersonal and

Self-directional. Today's workers have to be able to identify problems, formulate solutions, implement new ideas and communicate in a responsive manner to those with diverse perspectives.

My testimony today makes five specific recommendations. Given the broad constituent groupings impacted by the critical need to increase K-12 STEM graduates, support for these recommendations should be possible.

### **Information Processing and Technology Skills**

The students sitting in our elementary schools are the first generation to be born in the 21<sup>st</sup> century. They are sometimes referred to as Generation Z or the Net Generation. They are digital natives who are accustomed to the instantaneous feedback, the interactive and collaborative character, and the ease of use of the technologies that they are using for entertainment and communication. They don't use their cell phones for talking, but for texting and tweeting. Many preschoolers have learned the traditional kindergarten curriculum and more before setting foot into the brick and mortar of a school building. Their tools have been computers, ipads, Nooks, Leap Pads and a host of electronic "teachers." Digital learning and technology interface with all aspects of our students' lives. They empower users, encourage collaborations, and prepare tomorrow's workforce for communicating in a "connected world." Teachers and administrators must embrace new technologies, such as cloud computing and mobile devices, as legitimate "tools of the trade." Doing so will require a transformation in pedagogy. Replacing a textbook with a netbook or a chalkboard with a Promethean Board is not enough or even effective. Technologies need to be embedded in the instructional activities at all levels in all content areas. Digital learning and technology also includes data systems and assessment to monitor students' achievement and instructional effectiveness.

**Recommendation:** The pedagogical transformation to embed digital learning and new technologies require a comprehensive, supportive, and continuous program of professional development for teachers that focuses on the application and integration of new and emerging technologies into instruction and progress monitoring.

### **Thinking and Problem Solving**

Clarkson is a nationally ranked university. We have received recognition as one of the top 100 graduate and undergraduate Business Schools, top 50 Game Design Programs, and top 20 for Productions/Operation Management as well as several recognitions for value for investment. In 2010 our Digital Arts and Science major was named the most innovative program in North America by iDMAa. Perhaps we are best known as an engineering school. U.S. News & World Report, *America's Best Graduate Schools 2013* ranked our environmental engineering program

35<sup>th</sup> in the nation and civil engineering and chemical engineering as 68<sup>th</sup> and 70<sup>th</sup>, respectively. Twenty-five of our students have been selected as Goldwater scholars. As an institution we are focused on *Evolution to Excellence*, the theme of our vision and long range planning efforts. The success of this vision is to some degree reliant upon the “raw materials” that we have to work with. In other words, our incoming students.

The 2010 PCAST Report *Prepare and Inspire: K-12 Education in Science, Technology, Engineering, and Math (STEM) for America’s Future* suggests that a major challenge facing our nation is a lack of interest in STEM disciplines. As early as middle school, students have a negative perception of STEM courses and the relevance to their lives. They often “opt out” of higher level courses at high school. Disturbing national trends predict continued decreases in STEM enrollment, and research has shown a clear decline in positive attitudes toward science as students reach the high school level. This decline creates its own set of problems for us in higher education as incoming students may not have the prerequisite content to enter STEM majors. Therefore, it is incumbent upon educators, particularly middle school teachers, to inspire this next generation of workers, researchers and scientists. How best to do this?

The National Research Council identified the following transformative teaching practices: allowing students to “do” science and solve problems; providing structured group learning experiences; using computer technology applications; and promoting active, engaged “hands-on” learning. Research has shown that instruction which is project/inquiry based, student-centered or team driven, and presented in a framework that relates to the “real world” deepens the students’ understanding of course content and increases retention of critical knowledge. The group experience necessitates valuing both individual contributions and teamwork for success.

Earlier this month, on August 17<sup>th</sup>, Senator Kristen Gillibrand chose our campus as the venue to announce her co-sponsorship of the America Innovates Act, a bill aimed at driving innovation from the idea stage through to commercial production. While Senator Gillibrand was on campus, she had the opportunity to meet with several Shipley Center for Innovation entrepreneurs. These bright young individuals are applying research and technical skills to finding unique and cutting edge solutions to universal or societal problems, such as maximizing food production in limited space or unfavorable conditions. In other words, they are “doing “science.

Students in their pre-collegiate schooling need these same types of exciting, personalized experiences. A content-embedded, articulated curriculum of hands-on multi-disciplinary problem solving experiences focused on a relevant issues will engage students and foster their continued study in STEM high school courses and prepare them for the challenges of higher education and the workforce.

**Recommendation:** Identify model programs and schools that have successfully implemented inquiry/project-based learning and disseminate that information. Create a state- sponsored program of professional development, incentives and recognition to encourage replication.

### **Interpersonal and Self-directional Skills**

Partnerships among business, industry, higher ed and schools can offer students opportunities to solve real world problems as well as provide a sense of career direction. Job shadowing, internships and field experiences challenge students both intellectually and personally. These experiences also develop their interpersonal and job-performance skills. Being mentored by a STEM professional is a powerful tool for inspiring more students to enter the STEM professions. The informal discussions and the work activities build background knowledge about future job possibilities, give context to the students' current academic courses, and most importantly, build the personal attributes that employers are seeking. Working beside and interacting with an environmental engineer, a research scientist, or a systems analyst in a work situation can help students develop their personal skill set and clarify their goals. Unfortunately, the current structure of high school graduation requirements leaves little room for such opportunities. A one-size-fits-all academic program with rigid requirements does not encourage beneficial partnerships and limits students' ability to make choices. At the university level we have multiple pathways to a diploma. At Clarkson, professional experience is required in almost all majors. Within a flexible framework students make choices that facilitate their learning and career goals. High school students would benefit from a similar model wherein schools could offer different pathways to a diploma and students could exercise some self-direction and control over their path towards that diploma.

**Recommendation:** Revise the current academic requirements for a high school diploma to allow for multiple pathways and greater flexibility to incorporate experiential learning opportunities, particularly in the STEM disciplines.

For a significant number of students, extra-curricular activities are the foundation on which they build their transformation from novice to apprentice to career. Creativity, leadership, and teamwork, among other workplace skills, are valued and nurtured. Odyssey of the Mind, Science Olympiad, MathCounts, JETS, Energy and Environmental Expo, and CoMAP are some of the many regional and national competitions that North Country students participate in. Clarkson is proud to host an official Championship Robotics Tournament for both FIRST Lego League (FLL) and FIRST Tech Challenge. Now in its 5<sup>th</sup> year, this tournament draws teams from four states. Middle schoolers are recognized for their “gracious professionalism” and core values. High school teams analyze each others strengths and form alliances to maintain competitiveness. The Clarkson

SPEED Team also coaches a FIRST Robotics Challenge team that is composed of students from two local high schools. At all levels, teamwork, a critical 21<sup>st</sup> century skill, is highly prized.

**Recommendation:** Support targeted extra-curricular competitions through a state-wide organizational and funding structure that will allow equal access for all students regardless of school district or parental wealth.

### **Transformational**

There is no question that our schools face challenges. However, they do not have to face them alone. The North Country is home to 10 higher education institutions and hundreds of businesses that have human and technical resources which could improve the quality of education and the opportunities available to students. Until this year, there was no mechanism to open the dialogue and systemically link schools districts, businesses, industries and higher education. In February 2012, as part of its ongoing investment in our local and regional community, Clarkson became the North Country hub for the Empire STEM Learning Network. This grassroots Network will energize all stakeholders to invest in the educational experiences of our youth and the professional development of teachers to assure that 21<sup>st</sup> century skills are infused in tomorrow's leaders. In the short time it has existed, the Hub has been productive. Plans are being finalized for three regional professional development events to celebrate National Manufacturing Day in October. It is also establishing a cadre of industry professionals, led by Corning, Inc. and Siemens, Inc., who are willing to participate in problem-based learning activities in our local schools.

**Recommendation:** The Empire STEM Learning Network has the potential to transform and strengthen STEM education throughout New York State. The Empire STEM Network with its regional Hubs should be supported as a state-wide initiative and provided with the necessary resources to significantly impact PK-12 education.