



**National Center for
Technological Literacy®**

Museum of Science, Boston

Science Park
Boston, MA 02114-1099
www.nctl.org

**Written Statement of
Ioannis Miaoulis, Ph.D., President and Director,
Museum of Science, Boston
and Founding Director
National Center for Technological Literacy®
submitted to the
Presidential Council of Advisors for Science and Technology**

October 22-23, 2009

On behalf of the Museum of Science, Boston and our National Center for Technological Literacy (NCTL), I applaud the President's focus on STEM education and thank the distinguished members of the PCAST for their time and effort in support of STEM education.

The Museum of Science, Boston is one of the world's largest science centers and New England's most attended cultural institution. We work to bring science, technology, engineering, and mathematics alive for about 1.5 million visitors a year through our interactive exhibits and programs, serving 186,000 students and 100,000 more in traveling and overnight programs. The goal of the NCTL is to introduce engineering into K-12 classrooms nationwide.

Why K-12 Engineering?

With an economy in flux and a workforce at risk, educating the nation's future engineers and scientists and advancing technological literacy are more important than ever. We need a strong technical and engineering workforce to remain competitive and innovative. To maintain our country's vitality and security, we must expand students' understanding of technology and engineering and widen the pipeline to careers in these fields so that a diverse array of talented students can pursue them.

The key to educating students to thrive in this competitive global economy is introducing them to the engineering design skills and concepts that will engage them in applying their math and science knowledge to solve real problems. This is the way to harness the creativity of young minds. This is also the process that fuels innovation of new technologies.

Lately, K-12 math and science education has received a lot of attention, while K-12 technology and engineering education has been largely overlooked. The problem is that

the school science curricula still focus more on the natural, not the human-made or technological, world, and have taught little or no engineering. The beauty of engineering is that it is the connector that uses science and math to create the technological innovations that facilitate daily experience.

Our curricula frameworks were established in the nineteenth century society, when the society was largely agrarian - no phones, automobiles, or computers. Obviously, our world has changed but most curricula have not, leaving a huge gap in students' learning. While most people spend 95 percent of their time interacting with technologies of the human-made world, few know these products are made through engineering. We need to add technology and engineering as standard subjects in U.S. schools.

There are many reasons to introduce engineering in K-12 schools:

First, engineering is rich in hands-on experiences. Children are born engineers, fascinated with building and taking things apart to see how they work. Describing these activities as engineering can help them develop positive associations with the field.

Second, engineering brings math and science to life, demonstrating that they are relevant subjects thereby motivating students to pursue them. Relevance is particularly significant for girls and other underrepresented groups. Engineering pulls together many other disciplines, including math, science, language arts, history, and art, engaging children of differing abilities in problem-based learning, where teamwork is important.

Third, to create a diverse, technologically literate workforce, we need to support engineering in K-12 schools. Most engineers will tell you they were inspired by an engineer in their family. Unfortunately, the engineering profession is not diverse – we are mostly white men. Therefore, many children are not exposed to such role models nor have access to enhancement experiences which will lead them to pursue engineering careers. To break this cycle, expand opportunities, and diversify the profession, we must offer engineering education in K-12 classrooms to make those careers more desirable and accessible to all children from all backgrounds.

The fourth and major reason to start engineering early is that technological literacy is basic literacy for the 21st century. We live in a technological world. We need to understand how human-made things like shoes and band-aids are created, how they work, and how to improve them.

However, according to, *Technically Speaking: Why All Americans Need to Know More About Technology* (National Academy of Engineering/National Research Council, 2002, page 1), “Although the United States is increasingly defined by and dependent on technology ... its citizens are not equipped to make well-considered decisions or think critically about technology.” The report also said, “Neither the educational system ... nor the policy-making apparatus has recognized the importance of technological literacy.” Far beyond a facility with computers, “technological literacy” involves understanding

what technology is, how it is created, and how it influences our lives. To paraphrase from *Technically Speaking* (page 4), a technologically literate person should:

- recognize technology in its many forms;
- understand basic engineering concepts and terms such as systems, constraints, and trade-offs;
- have a range of hands-on skills in using a variety of technologies;
- know that people shape technology and technology shapes behavior;
- know there are risks and benefits in using or not using technology to solve problems; and,
- be able to use math concepts to make informed decisions about technological risks and benefits.

An important goal of engineering education is to introduce students to engineering as a profession which takes skill, creativity, and knowledge of science and mathematics, but which novices can begin to practice in an intellectually honest way, just as they can practice scientific inquiry at an amateur level in an intellectually honest way. We want students to feel that engineering design can be fun, can help people, and is worth learning to do better. In addition, we want them to be exposed to the enormous range of technologies in use today, as well the enormous inheritance they receive of accumulated design know-how. Engineering is ongoing, and can be used to solve human problems. These are goals worthy of students' time and effort.

Understanding the importance of technological literacy and the need for trained engineers, the Museum of Science launched the National Center for Technological Literacy in 2004 to enhance knowledge of engineering and technology for people of all ages and to inspire the next generation of engineers and scientists. A detailed description of our work follows the Challenges and Recommendations sections.

Challenges

While the NCTL has made tremendous progress in advancing K-12 engineering education in Massachusetts and in an increasing number of states, we have encountered a number of challenges that can be overcome.

Because K-12 engineering education is not terribly widespread, the one challenge lies in the sense of apprehension and misunderstanding by teachers and administrators. Engineering may frighten some teachers, especially those uncomfortable with science. However, once they have received our training, which ranges from a day and a half to three weeks, most are excited and willing to implement.

Through our professional development training, we explain that the engineering design process is similar to scientific inquiry that explores the natural world, except that engineering explores the human-made world (see comparison chart in appendices). This provides a frame of reference and comfort level. We do not expect our teachers to

teach something as complex as tribology and finite element analysis. We do want them to expose students to open-ended problem-solving using limited resources or designing under constraint.

Lack of appropriate resources is another challenge. Schools and teachers need access to effective instructional materials and hands-on kits so students can actually apply their skills.

Some argue there is no time to add a new topic to an already packed school year. They express concern that adding another subject or topic will simply extend the content rather than allow deeper exploration. Our engineering curricula allow students to multi-task – applying science, math, language arts, and technology in engineering design challenges thereby covering multiple subjects at once. As one elementary teacher says, “it’s an add-in, not an add-on.”

Another concern we hear is that there are no separate engineering education standards for curricula development, teacher preparation, student achievement, etc. Some advocate for the creation and implementation of new separate K-12 engineering standards and assessments. Some advocate the revision of existing standards including math, science and technology standards to incorporate and integrate engineering education. The National Academies of Engineering is currently studying these options and that report is due to be published next year. We support the integration of engineering in all grades, particularly in science and math, and separate courses for both middle and high school students.

It is important to note, on the assessment front, that the National Assessment of Educational Progress - Science 2009 will include a number of items that will assess student technological design skills. Further, the National Assessment Governing Board is currently developing a Technological Literacy study that will likely assess design and systems thinking, as well as information and computer technology literacy, and technology and society.

Another challenge is the lack of recognition by some policy makers and education leaders that K-12 engineering education is taking place in classrooms across the nation and that positive results are occurring. This is further complicated by the fact that there are no existing federal programs to specifically support K-12 engineering education in core academic classrooms. Many agencies espouse support for STEM programs; however, most focus on science and math to the exclusion of technology and engineering. While the National Science Foundation, which has awarded several grants to the Museum and the NCTL, and other science and engineering agencies support STEM education, there are no specific programs designed to help all states pursue K-12 engineering education nor has there been any large scale research programs to measure the efficacy of the various curricular programs.

Recommendations

To respond to these challenges, we encourage the Chairman, the Committee and the Congress to consider legislation that will further implementation and research of K-12 engineering education. We suggest a three part grant program that would allow states to plan and to implement K-12 engineering education more broadly in their schools and to participate in a large scale evaluation. We suspect this research will confirm the promising preliminary results uncovered by the National Academy of Engineering K-12 Engineering Education study group and provide tremendous guidance to future development and implementation of K-12 engineering education, student learning and STEM, career aspirations.

Furthermore, as Congress considers revising the Elementary and Secondary Education Act, we suggest the following:

- Allow informal STEM education centers and other non-profit educational organizations to receive funds for teacher professional development;
- Expand and rename the Math/Science Partnerships to STEM Partnerships to include technology and engineering educators in teacher professional development opportunities;
- Encourage states to adopt technology and engineering standards and assessments;
- Encourage states to include technology and engineering in the definition of “rigorous curricula” for high school graduation;
- Expand the definition and requirement for “technology literacy” to go beyond the use of computers to include the engineering design process;
- Include engineering/technology teachers alongside math/science teachers in all incentive programs to recruit, train, mentor, retain, and further educate teachers; and
- Support after-school programs that include technology and engineering activities.

National Center for Technological Literacy: Mission and Function

The NCTL is integrating engineering as a new discipline in schools via: 1) standards-based, teacher-tested K-12 curricula development; 2) pre-service and in-service teacher professional development and leadership training programs; and, 3) advocating for aligned standards, assessments, and policies promoting K-12 engineering education. The Museum of Science is the only science museum in the country with a comprehensive strategy and infrastructure to foster engineering education and technological literacy in both K-12 schools and science museums nationwide.

I. Curricula Development

Our curricula follow in large measure the three core principles for K-12 engineering education recommended in the recent report by the National Academy of Engineering (NAE) and the National Research Council (NRC), *Engineering in K 12 Education: Understanding the Status and Improving the Prospects*. Our materials: 1) emphasize the engineering design process; 2) incorporate important and developmentally appropriate mathematics, science, and technology knowledge and skills; and, 3) promote engineering habits of mind including systems thinking, creativity, collaboration, communication and attention to ethical considerations.

The curricula we create are not intended to replicate college level sources. We intend to impart habits of mind that include an engineering design process, optimization, efficiency and economy. It allows students to apply their math and science skills to solve community-based problems. It opens their minds to a variety of technology and engineering careers they may have never heard of before. It demonstrates that all students are capable of engineering.

An early project of the NCTL was to examine existing K-12 engineering curricula. Our online *Technology and Engineering Curriculum Review* includes instructional materials in a searchable database. The most promising have been peer reviewed and mapped to national standards. During this review process, we discovered that very little was available to address the elementary grades. www.mos.org/TEC

Our philosophy is that children construct a much deeper understanding of the world around them, including science, technology, and engineering, when they interact with meaningful, challenging activities. The NCTL curricula development team performs a detailed curriculum development process that is based heavily on, *Understanding by Design* (Wiggins & McTighe, 1998).

For example, each of our elementary units entails more than 3000 hours of development over the course of two years. In addition to this development time, units are pilot tested across Massachusetts and field tested across the United States. A typical unit development cycle begins with background research and ends with a unit release two years later.

A major focus of our work is to expand interest in engineering across all demographics. Our curricular resources emphasize diversity, including both genders, and people of races, ethnic backgrounds, physical abilities, and cultures. We also work to integrate with other topics including science, mathematics and language arts.

The *Engineering is Elementary* series is closely aligned with popular elementary science topics and is steeped in language arts. The middle school series, *Building Math*, integrates algebra with engineering design challenges and is typically taught by math teachers and also used in technology education classes. The new middle grades series, *Engineering Today*, is aligned with science subjects. *Engineering the Future* is a

full year course that is taught by either technology/engineering educators or physics teachers.

A. Engineering is Elementary®

The Engineering is Elementary (EiE) project integrates engineering and technology with science, language arts, social studies, and mathematics via storybooks and hands-on design activities. Each unit begins with an illustrated storybook, in which a child from a different country uses the engineering design process to solve a community-based problem, and includes four lessons. Elementary school teachers nationwide can use these curricular materials to teach technology and engineering concepts to children in grades 1-5. The development of this series is funded in large measure by a National Science Foundation Instructional Materials Development grant as well several corporate sponsors.

The NAE report, *Engineering in K 12 Education*, cites EiE as one of the curricula offering the "most comprehensive" resources to support implementation. Materials "are clearly written to enrich and complement existing instruction...the emphasis on literacy is especially noteworthy." The EiE series "illustrates how a wide range of problems can be overcome through a systematic engineering design process that involves the application of math, science, and creativity...the idea that engineers combine creativity with their knowledge of math and science to solve problems is introduced and reinforced."

As of May 14, 2009, EiE had reached 15,660 teachers (750 in MA) and 1,021,725 students in 50 states and Washington, DC. Of those states, 34 have a significant presence with larger orders and professional development participants. Sales have also reached over one million dollars over the 5 years of sales. The receipts are reinvested into the enhancement and implementation of the curricula. These units can be obtained at www.mos.org.eie.

B. Building Math®

Building Math, created with Tufts University, provides innovative practices for integrating engineering with math to help middle school students develop algebraic thinking. Building Math consists of three middle school instructional units that uniquely integrate inquiry-based mathematics investigations and engineering design challenges. The engineering design challenges provide meaningful and engaging contexts to learn and use mathematics, and to develop students' teamwork, communication, and manual skills. The mathematics investigations yield useful results to help students make informed design decisions.

Building Math was pilot tested in Massachusetts and has sold almost 1,900 units and is estimated to reach almost 95,000 students. Six states have ordered more than 100 units and the curriculum is placed in 42 states at some level.

According to *Engineering in K-12 Education*, the units are "very deliberative in their use of contextual learning to make the study of math more interesting, practical, and engaging." The math activities have a "direct bearing on the solution to the problem." The materials are also "very consistent" in using the engineering design process to "orchestrate learning." The "richest" portion of the design process involves doing research and testing the final design and the "richest" analysis in the materials involves interpreting data and discovering "quantitative patterns and relationships."

Awarded the 2008 Distinguished Curriculum Award by the Association of Educational Publishers, the Building Math series for grades 6-8 are available from Walch Publishing www.walch.com.

C. Engineering Today: New Middle School Series

The NCTL is developing a new series of middle-school supplemental units that meet engineering and science standards by integrating the two subjects. Introduced by *WGBH Design Squad* reality TV shows, the hands-on units engage students in engineering design challenges that are informed by the relevant science topics. Students work in teams to tackle the challenges and learn about engineers and scientists who work on similar projects in the US Department of Defense laboratories. It will focus on 10 areas including communications, energy, aerospace, bioengineering, construction, and transportation. Pilot testing will begin in Fall 2010.

D. Engineering the Future: Science, Technology, and the Design Process®

Engineering the Future (EtF) is a standards-based, full year course engages high school students in hands-on design and building challenges reflecting real engineering problems. The textbook, narrated by practicing engineers from various ethnic and cultural backgrounds, encourages students to explore what engineering and technology are and how they influence our society. According *Engineering in K 12 Education*, one of the most prominent features of this curriculum is the "emphasis placed on people and story telling." All the laboratory activities "are broken down into very small pieces that build upon one another in a very incremental manner. The culminating design problems provide students a lot of latitude to be creative and to operationalize the problem in a way that capitalizes on their interests."

EtF is currently taught in over 25 states. Over the past three years, on site and online professional development has been delivered to more than 500 teachers. Preliminary studies show that students increase their understanding of engineering in all four EtF units. The *Engineering the Future* textbook and related materials are available from Key Curriculum Press www.keypress.com.etf.

E. Efficacy

Our curricula development process incorporates research, evaluation, and assessment into all aspects of its design and testing. During the development, pilot and field testing, students complete pre- and post-assessments that measure pupils' understandings of engineering, technology, and science or math concepts. Most of our post-implementation research has focused on EiE and to a lesser extent, Building Math.

National, controlled studies indicate that children who engage with engineering and science through EiE learn engineering, technology, and related science concepts significantly better than students who study just the science (without engineering). This was true for both sexes and all racial/ethnic groups. They were also more positive about the prospect of being an engineer after participating in EiE.

Teachers also report that EiE curricular materials work well, whether students are low- or high-achieving, including those with cognitive, linguistic, and behavioral challenges, who are girls, children of color, or at risk in other ways.

Promising preliminary research indicates that EiE may be narrowing the achievement gap. In a national controlled study, thousands of students who participated in an EiE unit and related science instruction were compared to a control group that studied only the related science instruction. In two of the three units studied, the performance gap between low and high socioeconomic students was significantly smaller after participation in an EiE unit.

In summary, EiE students:

- are much more likely to correctly answer science content questions relating to the unit after completing an EiE unit;
- are much more likely to correctly identify the work of the field of engineers related to the unit on the post-assessment after completing an EiE unit;
- are much more likely to correctly identify relevant aspects and types of technologies featured in the unit after completing an EiE unit;
- demonstrate a much clearer understanding of relevant criteria for a design, as well as how to judge a design against those criteria, after completing the *Designing Plant Packages* or the *Evaluating a Landscape* unit;
- are significantly more likely to choose a more scientific method for answering a hypothetical question after completing the *Designing Plant Packages* unit;
- show that they understand what a model is after completing the *Evaluating a Landscape* unit;
- demonstrate a clearer understanding of materials, their properties, and their uses in different engineering design scenarios after completing the EiE unit *Designing Maglev Systems*; and
- show evidence of increased data analysis skills after completing the *Designing Maglev Systems* unit.

EiE professional development is also influencing teachers, who report large gains in their knowledge and understanding of the range of engineering disciplines, what engineers do, and the pervasiveness of engineering. They also report changes in their pedagogy after learning about EiE and teaching. All EiE research can be found here: www.mos.org/eie/research_assessment.php#formalfindings

At the Science and Technology Committee field hearing in Texarkana, then Assistant Director of the NSF, Education & Human Resources Directorate, Dr. Cora Marrett noted, "Studies show that children using the Engineering is Elementary materials gain in their understanding of engineering and science topics, compared to children not using the materials. In addition, children in the experimental group come to know what engineers do and what technology entails... Initial research suggests that this approach has been successful in helping young children envision themselves as engineers."

With the Building Math units, students engage in algebraic reasoning by modeling physical phenomena, analyzing change in both linear and non-linear relationships, extrapolate and interpolate data based on trends, describe the shapes of graphs within meaningful contexts, represent data in tables and graphs, and generalize patterns.

Our research shows that when engaged in Building Math design challenges, middle school students at different grade levels use algebraic reasoning when analyzing changing rates of an exponential function, interpret slope in a meaningful context, and use a mathematical model to make reasonable predictions. They then use this understanding to inform their engineering designs to meet the criteria and constraints of the challenge. (ASEE, 2008)

Integrating algebra and engineering can be done effectively by having math be essential to informed engineering decisions. A contextual approach for the units provides engagement in the activity, especially when students can learn together in small groups. Through the Building Math activities, students can find meeting the engineering design challenges satisfying without being overly competitive. The findings from this analysis indicate that it is possible to make non-linear, exponential functions accessible to students of different grade levels using different approaches.

II. Professional Development

While science centers and museums are known to spark life-long interest in and understanding of science, engineering, mathematics, and technology, few appreciate the extent to which these informal science education organizations impact the formal education setting. Science centers and museums have resources that many schools do not and offer interactive, professional development activities that support school curriculum.

The Museum of Science and the NCTL routinely work with school districts to bring the excitement of the science, technology and engineering to the classroom, while providing support and resources for teachers through field trip workshops, pre- and post-visit

activities, teacher professional development, outreach, and linking resources to state and national learning standards.

We understand that professional development necessitates partnership. We work closely with local or state agencies to provide professional development for teachers about engineering and technology. We employ a train-the-trainer model, working jointly with teacher educators to help them better understand core engineering and technology concepts, how to most effectively communicate these to other teachers, and how to structure and run workshops about engineering and technology.

We also work with other educational institutions to offer professional development opportunities. Two such partnerships are noted below:

- The NCTL is working with three Massachusetts community colleges to help educate pre-service elementary teachers with a three-year NSF Advanced Technology Education grant. The Advancing Technological Literacy and Skills (ATLAS) Project builds their understanding of technology and engineering content and teaching tools in community college coursework. Faculty engage in engineering design challenges, connect technology and engineering concepts with science, mathematics, literacy, and other subjects, learn about technical career options, and modify courses to include technology and engineering. The project includes outreach to four-year colleges and high schools working with the community colleges to ensure continuity and create a cadre of faculty to introduce this technology and engineering pedagogy to colleagues across the state. More details can be found here: www.mos.org/eie/atlas/index.php
- To address the national shortage of technology educators, “Closing the Technology & Engineering Teaching Gap,” a new K-12 initiative, is integrating NCTL materials into the fully accredited online technology education programs of Valley City State University (VCSU), North Dakota. The goal is to improve the technological literacy of K-12 teachers and prepare qualified teachers. The NCTL is making its curriculum materials and training available to VCSU via this innovative online teacher certification program.

The NCTL’s train-the-trainer approach to professional development helps teacher educators understand engineering and technology concepts, communicate them to other teachers, and run workshops. The NCTL has worked with teacher educators from over 25 states and Washington, DC, through institutes and online courses to familiarize them with engineering and lead professional development workshops in their region. A list of our educational partners appears in the Appendices.

We also conduct education leadership training for school and district administrators. The Gateway to Engineering and Technology Education project builds a community of school and district leaders in sharing best practices, experiencing hands-on engineering activities, and helping each other solve problems in order to implement technology and engineering standards. An Institute of Museum and Library Services grant allowed us

to support 50 school district leadership teams over the first three years. Participant district leadership teams collaborated during summer institutes, call-back days and online forums with other Gateway teams.

In Massachusetts, the Gateway program has reached nearly 300 teachers and administrators and 319,028 students (34.1% of MA public school enrollment). This Gateway model is being used in a partnership with Maine Math and Maine Mathematics and Science Alliance and Transformation 2013 in Austin and San Antonio, TX.

The Museum and the NCTL enhance the capacity of teachers to engage their students in STEM learning. Early evaluation findings suggest that, in addition to increased knowledge, teachers participating in the programs report feeling “renewed enthusiasm” and “rejuvenation” for teaching and learning about science. Future research could explore the longitudinal impacts of such programs for teacher interest and motivation for teaching and learning about science, as well as the impact on increased teacher retention.

III. Advocacy

Another function of the NCTL is advocacy. We work to develop policy and programs to support the advancement of K-12 technology and engineering education. We work at all levels of government to inform policy makers of the benefits of engineering education and how they can help promote and sustain it. We also work with like-minded organizations to further K-12 technology and engineering education across the nation.

We have been involved in the following advocacy efforts: 1) incorporating questions on technological design alongside those on scientific inquiry in the National Assessment of Educational Progress (NAEP) Science Framework for 2009; 2) the National Governors Association STEM agenda which calls for the adoption of technology and engineering standards and assessments, among other things; 3) the America COMPETES Act, which creates opportunities for technology teachers and engineering instruction at several federal agencies; and 4) the Higher Education Act expands the definition of “technology literacy” to include the engineering design process.

In 2001, I had the privilege of working with the state Massachusetts to develop the first statewide K-12 curriculum framework and assessments for technology and engineering in the nation. While forty states address technology education in their standards (often found in career and technical education standards), several states are also moving to include engineering in their core academic state standards. The NCTL has been in contact with people interested in K-12 education in all 50 states and Washington, DC, in various ways. We have worked specifically with New Hampshire, Minnesota, North Carolina, Ohio, Florida, Oregon, and Washington in revising state standards to include engineering in some form.

Conclusion

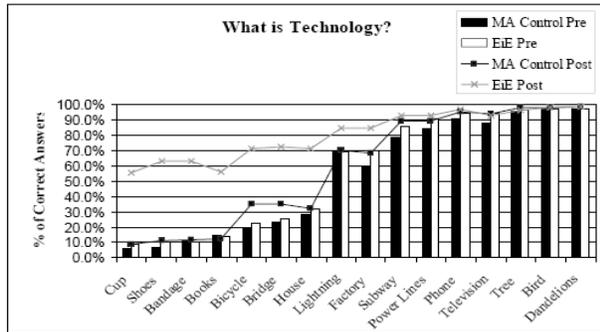
Thank you for the opportunity to present our efforts to promote, develop and implement K-12 engineering education across the nation. The National Center for Technological Literacy stands ready to assist in re-engineering today's schools, inside and out. Please visit our website, www.nctl.org. If we can provide any additional information, please let me know.

Appendices

1. Inquiry and Design

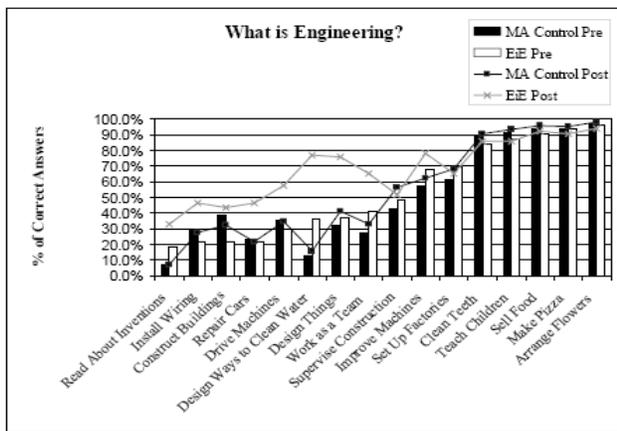
Scientific Inquiry	Engineering Design
Formulate a question.	Define a problem.
Research how others have answered it.	Research how others have solved it.
Brainstorm hypotheses and choose one.	Brainstorm solutions and select one.
Conduct an experiment.	Create and test a prototype.
Modify hypothesis based on results.	Redesign solution based on tests.
Draw conclusion, write paper.	Finalize design, make drawings.
Submit paper for peer review.	Present optimal solution to client.
Ask new question	Define new problem.

2. Engineering is Elementary Results



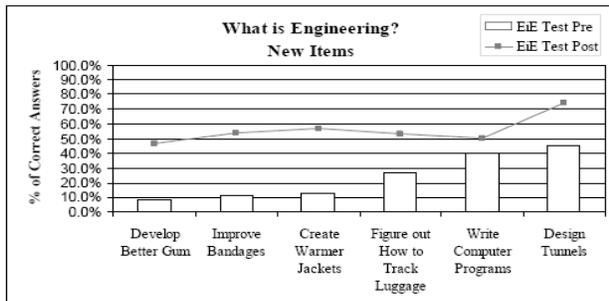
What is Technology?

Students were asked to identify 12 of 16 items that were forms of technology. Of the 9 items that were more difficult to classify - cup, shoes, bandage, bicycle, house, lightening, & factory - EiE students improved significantly.



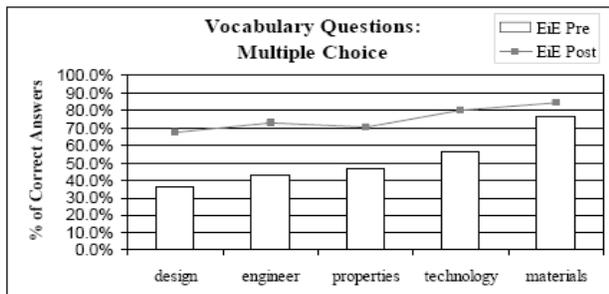
What is Engineering?

Students were asked to identify things that engineers might do on the job. EiE students showed significant improvement on 10 of the 16 items. The others were too easy. Where comparison to a control sample is available, EiE students have, for the most part, performed significantly better than the control students.



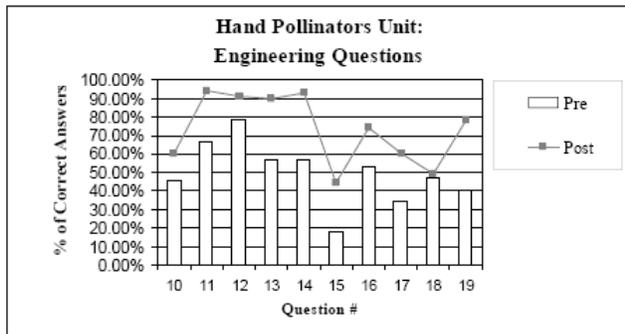
Myth Busters

More EiE students think that engineers might read about inventions, work and design as a team, and fewer think engineers drive machines, repair cars, install wiring or construct buildings.



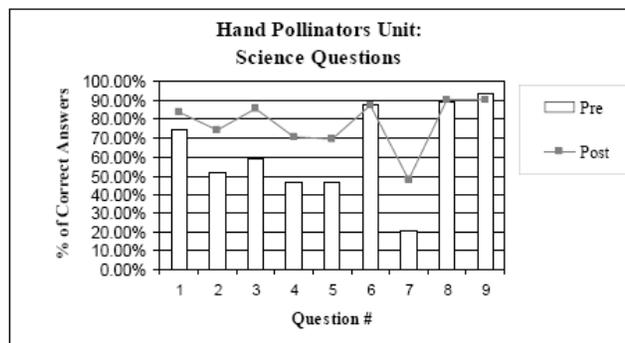
Getting it Right!

EiE students were significantly more likely to choose the correct vocabulary word on the post-assessment than on the pre-assessment. Control students did not receive these questions so there is no comparison available.



Elementary Students Learn Engineering!

Engineering is Elementary students consistently showed improvement—frequently dramatic improvement—on post-assessments designed to assess student understanding of science and engineering concepts.



Science Achievement Enhanced

Students were asked a series of questions about the roles of insects, plants, and parts of plants in the pollination process and whether sunlight, insects, people, and water are needed by plants to survive. On the more difficult science questions, EiE students improved significantly. Questions 6, 8 & 9 were too easy and not useful.

3. States that have purchased NCTL Curricula

Engineering is Elementary is in all 50 states and DC.

Building Math is in: AK, AL, AR, AZ, CA, CO, CT, DC, DE, FL, GA, IL, IN, KY, LA, MA, MD, MI, MN, MO, MS, NC, ND, NE, NH, NJ, NM, NV, NY, OH, OK, OR, PA, RI, SC, TN, TX, VA, VT, WA, WI.

Engineering the Future is in: AL, CA, CT, FL, GA, MA, MD, MI, NC, ND, NH, NJ, NY, OH, PA, RI, SC, TX, VA, VT.

4. **National Center for Technological Literacy Funders**

Total: \$57.4 million as of August 24, 2009 for formal and informal education efforts.

Federal Funding

Institute of Museum and Library Services
National Aeronautics & Space
Administration
National Institute of Standards and
Technology
National Science Foundation
U.S. Small Business Administration

State Partners

Massachusetts Board of Higher Education
Massachusetts Department of Elementary
and Secondary Education
Massachusetts Technology Collaborative

Foundations

Boston Foundation
The Cargill Foundation
GE Foundation
Gordon Foundation
The Highland Street Foundation
Harvard Pilgrim Health Care Foundation
The Charles Hayden Foundation
S.D. Bechtel, Jr. Foundation
Stephen Bechtel Fund
Massachusetts Biotechnology Education
Foundation

Corporations

AeroVironment, Inc.
Cisco Systems, Inc.
E.I. du Pont de Nemours & Co.
GreenFuel Technologies Corporation
Hewlett-Packard Company
Intel Corporation
Liberty Mutual
Lockheed Martin Corporation
Mercury Computer Systems, Inc.
Millipore Corporation
Novartis Institutes for BioMedical
Research, Inc.
Philips Medical Systems
Teradyne, Inc.

Individuals

Sarah and Jeffrey Beir
Mr. and Mrs. Richard Burnes, Jr.
Mr. and Mrs. Paul Egerman
Paul Howley
Dr. and Mrs. Donald Kaplan
Segundo and Laura Mateo
Mr. and Mrs. Raymond C. McAfoose
Carolyn W. Miller
Dr. Leo Liu and Dr. Pendred Noyce
Mr. and Mrs. Ira Stepanian
Mr. and Mrs. Henri A. Termeer
Alice and A. Zaff
Mr. Michael J. Zak and Mrs. Roxanne Zak

5. Educational Partnerships

Formal Partners

Building Engineering and Science Talent/NDEP
Maine Mathematics and Science Alliance
Minnesota Department of Education
New Hampshire Department of Education
Stevens Institute of Technology, NJ
Transformation 2013: Education Service Center (ESC) Region 13 - Austin, TX and ESC
Region 20 - San Antonio, TX
Valley State City University, ND
Villanova University College of Engineering, PA

Educational Collaborators

Aldine Independent School District, TX	North Central Texas College
Charles Dana Center, Austin, TX	Ohio Department of Education
ESC Region 1 - Edinburg, TX	Oregon Museum of Science and Industry
ESC Region 3 - Victoria, TX	Oregon State University
ESC Region 4 - Houston, TX	PA Department of Education
ESC Region 9 - Wichita Falls, TX	Purdue University, IN
ESC Region 11 - Fort Worth, TX	Putnam County Education Service Center, OH
ESC Region 12 - Waco, TX	Sally Ride Academy, WI
ESC Region 16 - Amarillo, TX	Science and Math on the Move Center, OH
ESC Region 18 - Midland, TX	Science Museum of Minnesota
Falcon School District #49, CO	Stark County Education Service Center, OH
Georgia Department of Education	Texarkana ISD, TX
Hofstra University, NY	Towson University, MD
Long Beach Unified School District, CA	Tufts University, MA
Massachusetts Department of Elementary and Secondary Education	University of Louisville, KY
Minorities in Mathematics, Science, and Engineering, OH	University of Maryland Baltimore County
Mobile Area Education Foundation, AL	University of Alabama, Huntsville
Montgomery County ESC – Dayton, OH	University of Cincinnati, OH
North Carolina State University	University of Texas - Austin
National Governors Association, Center for Best Practices	Vermont Department of Education
	Wichita Falls ISD, TX
	Worcester Polytechnic Institute, MA

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September 11, 2008

*To the commemoration of the victims of 9-11 horror and
comfort for their relatives and friends*

PERSONAL LETTER-APPEAL TO SENATORS OBAMA AND BIDEN

Dear Senators Obama and Biden, future President and Vice President of
the United States of America:

I would like to share with you some of my thoughts that might be, hopefully, useful for your leadership's vision how to formulate essentially basic, absolutely necessary, true National (it means nonpartisan) far-reaching and wide-ranging goals of the policies of your coming very soon Administration as well as the tools and means you would be able to use mobilizing the majority of the Nation for implementation and achieving these goals at the end of the first term of your Presidency and Vice Presidency, your Administration, as well as for the time of the next successful terms of your Presidency, Vice Presidency and far beyond for the times to come.

You would be confronted, of course, from the day one of your coming Administration with many urgent day-to-day crises like mortgage, credit crises and others of the same type of crises which are to some extent principally **on the spot, impermanent, in the short time** by nature that requested mainly ad hoc reactions by you and your Administration. It is not the topic and theme of my letter-appeal to you.

In the same time you have to be prepared to lead and help the Nation with your vision how to handle with other very deep-seated by nature, fundamental, profound, systematic national unresolved crises that might confront our Nation remarkably and lastingly for foreseeable future. Among these crises are crises like, for example, crises in public school and education system, in public health care system, in public intellectual properties system, in federal election campaign system, in governing system, ecological crisis. These crises cry and insist on the very solicitous, very thoughtful and principal, vital proactive **changes, reforms** in the corresponding policies in order to resolve those crises and as a result - to achieve and support for the extended period of time prolonged prosperity and security, safety of this Nation, its population. Profound proposals for such **changes, reforms** have to be followed from your comprehensible, intelligible leadership vision quite understandable for electorate and all citizens of the United States of America.

The United States, the whole World changed dramatically and radically after 9-11 tragedy and after some absolutely wrong and dangerous, ad hoc by nature policies pursued by the two terms of Bush Presidency and his Administration that severely

and crucially damaged prosperity of the United States and its population domestically and its international standing and influence abroad.

As one of the best politician of the first half of the XX century Winston Churchill wisely said once – *“Americans will always do the right thing, after they have exhausted all the alternatives.”*

So, from what such “right thing” to start with?

As one of the best politician of the second half of the XX century our former two terms successful President Bill Clinton quite recently wisely and to the point famously said at the Democratic Convention in Denver – *“...America cannot be strong abroad unless we are strong at home. People the world over have always been more impressed by the power of our example than by the example of our power.”*

So, what kind of absolutely necessary proactive and profound **changes, reforms** in the domestic policies and the policies for the international standing of the USA in the World must be formulated and pursued by your coming Presidency, Vice Presidency and Administration from the day one?

There is the long list of them of course. But from what kind specifically to start with by your vision proclamation from the day one January 20, 2009 of your Presidency, Vice Presidency and your Administration in your coming inauguration speech? It is the main question for your proactive preparation and decision making. But, please do not do some ad hoc tricky answers before formulating the main domestic crises and fundamentals behind them that might severely influence the foreseeable future of the USA and its population domestically and in the World. I would like to remind you the famous quotation on the theme **“To be or not to be? It’s the question”** from the poem “My Hamlet” (1972) written by the Great Russian poet and bard of the XX century Vladimir Visotsky –

*”But we are still assigning tricky answer,
And can not find, at least, the needed question.”*

The bitter lessons from the tragic events September 11, 2001 must go far beyond simply suppressing and eliminating any chance to succeed for any attempts of acts of international conspired **organized** terrorism. The **indirect** influence of tragic events September 11, 2001 had and still has to be seen as the **alarm bell** of the necessity to understand the roots of our temporal weaknesses empowered by ad hoc terrible actions of the Bush Presidency and his Administration, to go back to basics, to rethink fundamentally why political and social fabrics of this Nation, its domestic policies and policies in the sphere of international relations are failed miserably to prevent the success of that horror.

As Russian proverb says: *“It was not fortune then misfortune helped”*.

Follow up to the recommendation from former President Clinton it is absolutely necessary to start by making the United States of America strong at home again.

In Jan. 23, 2005 issue of the national published magazine PARADE its staff asked Contributing Editor Norman Mailer—one of nation’s foremost writers and social observers—to answer the question: If you could do **one** thing to change America for the better, what would it be? Mailer’s “**one** thing” was provocative enough - he suggested *“a ban on TV commercials”*.

Magazine PARADE at that issue asked its readers if you agreed with Mailer and also what “**one** idea” you might have to change America. Nearly 6000 readers responded. I was among them. Magazine PARADE later on in June 26, 2005 issue

selected for publication on its pages only 5 responds-suggestions. My suggestion-respond was among these published 5 suggestions-responses. Magazine PARADE published on its pages my suggestion in some compressed edited form as: *“Perhaps the most unusual suggestion came from Dmitry A. Novik of Washington, D.C. “Each child born in the U.S.A. would receive a check for \$10,000 from the government on his or her third birthday,” he proposed. “The money would then be invested in a 15-year government bond. On his or her 18th birthday, the child would receive the money if he or she had been enrolled in all three levels of public schools and had graduated from a public high school.”*

It is very hard any time to find the only one, unique idea, corresponding legislation act and its execution that would change the United States of America for the better making the United States of America strong again. Such One Idea – if it exists – has to be satisfied to at least 3 main conditions-criteria:

- it has to be targeted on the solution of the most critical situation for the USA and its population not only in the short run but mainly in the long run, for foreseeable future;
- it has to be influential for the broadest spectrum of different aspects of economical, social and political life for the whole population of the USA;
- it has to be affordable morally, economically, financially, socially and politically.

Such unique One Idea exists fortunately and I was lucky to find and formulate it.

My suggestion-respond One Idea was really and originally formulated in my letter written Jan. 27, 2005 to magazine PARADE under the title **“ONE IDEA THAT NOT ONLY MIGHT BUT SHOULD CHANGE AMERICA FOR THE BETTER”**, (3 pages long), [1] as such incentive:

“Each child who is born in the USA should receive to the day of his/her 3-year birthday from the Federal Government the gift of the check on 10,000 dollars that would be put on the name of that child in the 15 years bond issued by the Federal Government. At the day of 18-year birthday the child should receive the accumulated money from such bond if and only if the child and his/her parents have been matched to the following requirements – he/she had been enrolled by his/her parents in the all 3 levels of public schools and he/she successfully graduated from public high school. In the case when such requirements are not matched the accumulated money from bond are put in a special Federal trust fund that can and should be used by the Federal Government only and exclusively to additional finance support of improvements day care services, pediatric medical services and public schools”.

Let’s now explain why such One Idea fully and comprehensively satisfies to all 3 criteria mentioned above.

The One Idea - as the first criteria is concern - targets indeed the most critical situation for the prosperity, national, economical, social securities of the USA and its population, its citizens for foreseeable future.

There is no doubt that the current system of the public schools and education in the USA is, unfortunately, in the big troubles, it is broken. It is the most serious and influential crisis for the USA and its population, crisis that is so vividly and widely

influential not only for today life but, what is no less important, for foreseeable future. The USA is on one of the last place in the list of 24 developed countries by the level of skills of the public high school graduates in science and math. The very essential percentage of the public high school students dropped the high school before graduation.

As the result the USA colleges and universities cannot fill up their undergraduate and graduate schools in science, technology, engineering and mathematics by the graduates from the domestic public high schools of the USA what forces the USA colleges and universities to compensate such shortage by attraction foreign high school graduates to fill the gap.

The low average level of home high school graduates especially in math and science, the high percentage of students that are not graduated from home high schools at all are the main reasons of severe shortages to fill job positions in high tech industries and in such crucial public services as modernized educational, medical and military (national security) services for example. Attraction a high number of highly educated foreigners-immigrants and migrants to compensate such shortages - that is only the contradictory **illusion** of solution especially in the long run perspective - eliminates market oriented, supply and demand incentive to improve home, domestic public schools and education level, improvement and progress in our economical and social well being.

Such shortages are direct threats to the national and economical securities of the USA in the XXI century with its dominant role of the high tech industries and services in economical, social, political and security life.

Comprehensive explanation and elaboration why my One Idea satisfied fully the other two criteria mentioned above can be found by reading my text [1] which is added as Appendix I of this letter to you. I highly recommend, **urge you to read that text by you personally.**

Of course the measure One Idea alone is not able to heal, improve public school and education system in the USA. There are some additional measures that needed like improving professional skills of teachers, for example, and some others. But the measure One Idea is **absolutely** necessary measure. It is no hope without its implementation because the One Idea established and stimulated first time the extremely crucial role of **parents** in the successful education of their kids.

Let's note that improving public school and education is one of the crucial aspects for the prosperity and security of the USA and its population for foreseeable future in XXI century and beyond.

Nevertheless, the public education is the only one among other main basic public services has to be provided and supported by the Federal Government to the American people in their all kinds of activities in order to achieve and support the goals proclaimed in preamble of our Constitution – *“to form more perfect Union, insure domestic Tranquility [it means to be free from disturbance, domestic instability], provide for the common defense, to promote the general Welfare, and secure the Blessings of Liberty to ourselves and our Posterity”* [it means to future generations too].

I tried to elaborate and made suggestions on very important **changes, reforms** in policies associated with such fundamental public services have to be provided and

supported by the Federal Government like the public (federal) system of promoting free enterprise and innovations, the public (federal) health care system, the public (federal) system of education, the system of the federal elections, the federal system of providing and supporting public security and safety in my essay-paper written 10/25/2001 under the title “**BACK TO BASICS IN THE AFTERMATH OF THE TRAGIC EVENTS SEPTEMBER 11, 2001**” (16 pages long), [2]. Such text [2] is added as Appendix II of this letter to you. I highly recommend, **urge you to read that text personally**.

Well, no one is perfect, no one is free from mistakes but the worst thing to do is not to extract the right lessons from the tragic events September 11, 2001. It would be no less national tragic event if the Nation did not figure out all the right lessons and accordingly did not create and implement wide-ranging and far-reaching recommendations capable to make necessary corrections, changes in the Federal Government, laws and regulations.

Unfortunately, the whole story how and when the National 9-11 Commission had been organized, how its composition had been created, its members and executive director had been selected, how the highest echelon of the Bush Administration, President Bush, Vice President Cheney, other senior members of their Administration obstructed to the truthful work of that 9-11 Commission, how the final report of the 9-11 Commission had been written, published and submitted to the President, the Congress and to the Nation for **public** discussion and debate is one more unmistakable and clear proof of the inexcusable failures of the Bush Administration and Republican Congress that preclude the Nation to figure out the right lessons and accordingly was not able to create and implement wide-ranging and far-reaching recommendations to make absolutely necessary fundamental corrections, changes, reforms in the policies pursued by the Federal Government and necessary restructuring in the Federal Government, laws and regulations.

Let's remind that due to the unforgivable and purely politically motivated resistance by President Bush, Vice President Cheney and Republican leaders of the 107th Congress the National 9-11 Commission was not able to be organized till the very end of 2002 (?!), that due to then after constant resistance by the Bush Administration in fully and sincere cooperation, support for investigations and analysis by that Commission the Nation **7(!)** years later after tragic events September 11, 2001 was deprived still to know the whole truth, **all the facts** associated with these tragic events, to formulate the **right lessons** from tragic mistakes that led to incapability to prevent the tragic events September 11, 2001, to implement appropriate comprehensive the **wide-ranging and far-reaching recommendations** that would be capable to prevent **forever** the repetition of horrors like happen to be September 11, 2001.

In the absence of such appropriate comprehensive recommendations the Bush Administration and the Congress in the rush ad hoc manner tried to solve the problems of national (homeland) security by essential tricky answers by purely bureaucratic exercises – by **increasing** the Federal Government with creating additional redundant Federal department and agencies, with creating additional levels of Government bureaucracy and correspondingly increasing none efficient excessive budgetary spending.

It is an irony that Republican President and Republican leaders of the 107th Congress as the respond to 9-11 horror increased the Federal Government and the budgetary spending quite contrary to the Republican orthodoxy of the **small** government and **decreasing** budgetary spending by the Government.

Let's highlight that *our Federal Government is not efficient not because it is big but rather it is big because it is not efficient*. Creation of the **huge permanent** unmanageable and severely inefficient Cabinet level Department of Homeland Security is maybe the most visible example that only underlines such truism.

It started October 8, 2001 when President Bush by his Executive Order established in the Executive Office of the President one more layer of bureaucracy in his office - a new Office of the Homeland Security and creating additionally to National Security Council a new Homeland Security Council¹.

Comprehensive elaboration and very detailed, scrupulous thorough explanation of the wrong ad hoc reactions by President Bush, his Administration and by the Congress on 9-11 horror in the post 9-11 time as well as my alternative recommendations can be found in particularly by reading my report under the title **“ALTERNATIVE APPROACH TO EFFICIENT AND EFFECTIVE REORGANIZATION AND RESTRUCTURING OF THE FEDERAL GOVERNMENT AFTERMATH THE LESSONS FROM THE NATIONAL TRAGEDY SEPTEMBER 11, 2001 HAVE BEEN UNCOVERED AND LEARNED.”** (56 pages long), [3] written May 25, 2004 and sent the same day to the National 9-11 Commission, the report that is added as Appendix III to this letter to you. I highly **recommend, urge you to read that report [3] by you personally** or to be briefed by your senior assistants.

Essentially purely **partisan** and therefore **wrong** composition of the **National 9-11 Commission** – there was not **any** professional nonpartisan **independent** member of the Commission, among members of the Commission was no **any** representative(s) from the families of the real victims of 9-11 horror, as well as selection as the Executive Director of the Commission Dr. Zelikow who is directly associated with the top echelon of the Bush Administration – predetermined why the mission and goals of the **National 9-11 Commission** proclaimed by the law has not been accomplished by such wrongly composed National 9-11 Commission.

I thoroughly analyzed transcripts of all 12 Public Hearings before the Commission as well as the final Report of the Commission submitted to the President and the Congress. As the result of such comprehensive analysis I wrote August 11, 2004 my report under the title **“ANOTHER 7/22 DEBACLE ALMOST THREE YEARS AFTER THE 9/11 NATIONAL TRAGEDY. (Critical analytical remarks to the national debate on the recommendations of the National 9/11 Commission final report released to public July 22, 2004)”** (42 pages long) [4] that I sent the same day to the National 9-11 Commission, to the President and Leaders of

¹It so vividly reminded the purely bureaucratic reaction by the Communist Administration in the former Soviet Union to the sever shortage of the agriculture products in food supply for soviet population by creating additionally to Ministry of Agriculture and Ministry of Meat and Milk Industry an additional new Ministry of the Fruits and Vegetable Products. Anyway, such purely bureaucratic exercise did not help to achieve the sufficient level of food supply for soviet population.

the Congress. I highly **recommend, urge you to read that report [4] by you personally** or to be briefed by your senior assistants.

Let's emphasized one more time that any composition of the future **National Commission(s)** without including as its (their) Chair(s) or Member(s) at least nonpartisan truly **independent** professionals representing the **independent, nonpartisan electorate** is a direct invitation, prerequisite to the fiasco for the work and the results, recommendations of such Commission(s) to the President, the Congress and to the Nation.

Let's emphasized also that it is necessary to reestablish the absolutely necessary requirement of really and fundamentally democratic tradition that requested that all personal **written** letters(s)-appeal(s) and suggestion(s)-recommendation(s) from **any** citizen of our country to the President, the Vice President, to the leaders of the Federal Departments and Agencies, as well as to the Leaders of the Congress, The Chairmen(women) and Rankin Members of the Congress' Committees, as well as to the Members of the Supreme Court **must** be responded with **written** letters to such citizen from those members of the governing leadership of our country.

Unfortunately, my experience with my written appeals and suggestions-recommendations to the members of governing leadership in the time of the Bush presidency is very bad one indeed – I did not received **any** respond from **anyone** starting from President Bush and down in governing leadership to whom I appealed with written letters-appeals and suggestions-recommendations in them. I received, quite contrary to that, the written responds on all my written appeals and suggestions-recommendations to the members of the governing leadership starting from President Clinton and down in the time of the Clinton presidency.

Finally I would like to share with you one my political proposal which potentially might reestablish the international leadership and admiration of the United States of America in the World, to be the tool to make America strong abroad again. It is my letter-appeal that I wrote and sent April 3, 2005 to leadership of the USA with proposal on the creation the new U.S. Requiem Memorial Museum in adjacent to the National Mall in the Washington D.C., the U.S. Requiem Memorial Museum commemorating the multimillion innocent victims of the political repression and massive terror committed by totalitarian communist regimes of the former USSR and its states-vassals-followers.

The creation the U.S. Requiem Memorial Museum together in close proximity across the street - Raoul Wallenberg Place - with the existing already U.S. Holocaust Memorial Museum would create the unique historical duo Memorial Museum complex in adjacent to the National Mall of Washington D.C. The future visitors of that complex – American citizens and foreign guests – would be able to learn lessons of the two greatest atrocities-crimes against humanity of the previous terrible XX century committed by fascist (nazi) and communist totalitarian regimes, to appreciate the leading role of the United States of America in defeating these regimes. That complex would play a unique and effective educational role in preventing any possibility to reemerge the fascist (nazi) and communist totalitarian regimes in the future.

Reemerging imperial totalitarian intentions in the power leadership echelon of the Russian Federation one more time emphasize how important it might be the role of creation of the U.S. Requiem Memorial Museum in Washington D.C.

I add to this letter to you as Appendix V [5] all my materials associated with proposal on creation a new U.S. Requiem Memorial Museum in adjacent to the National Mall in the Washington D.C. (the United States Requiem Memorial Museum commemorating the multimillion innocent victims of the political repression and massive terror committed by totalitarian communist regimes.). **I urge you to read my materials in the Appendix V [5] by you personally** or to be briefed by your senior assistants.

If only I can be helpful to you or your assistants for comprehensive evaluation and understanding of my suggestions-recommendations and proposal in my letter-appeal to you with accompanied materials I would be happy anytime in any place to give necessary personal face to face additional comments and getting it more clear answering on all your questions that might and should be followed after your readings and briefings on the matters of that letter-appeal to you and accompanied this letters Appendixes.

Beforehand thanks for you reading and listening. I hope to read or hear from you very soon.

Please, please help me to help you, to return the trust and insurance for population of this Nation that your Government once again really and reliably protects the freedom and safety as the most influential incentive to return the life in our country to normal, the real chance the freedom to flourish and the happiness may be pursued again, to make the United States of America strong again at home and abroad.

With best wishes for success in November 2008 election and your leadership,

Sincerely, I'm truly yours

Dmitry A. Nevik

- [1] Appendix I: **“ONE IDEA THAT NOT ONLY MIGHT BUT SHOULD CHANGE AMERICA FOR THE BETTER”**
(file: only ONE IDEA).
- [2] Appendix II: **“BACK TO BASICS IN THE AFTERMATH OF THE TRAGIC EVENTS SEPTEMBER 11, 2001”** (file: backtobasicspaper).
- [3] Appendix III: **“ALTERNATIVE APPROACH TO EFFICIENT AND EFFECTIVE REORGANIZATION AND RESTRUCTURING OF THE FEDERAL GOVERNMENT AFTERMATH THE LESSONS FROM THE NATIONAL TRAGEDY SEPTEMBER 11, 2001 HAVE BEEN UNCOVERED AND LEARNED.”** (file: recommendation9-11Commision).
- [4] Appendix IV: **“ANOTHER 7/22 DEBACLE ALMOST THREE YEARS AFTER THE 9/11 NATIONAL TRAGEDY. (Critical analytical remarks to the national debate on the recommendations of the National 9/11 Commission final report released to public July 22, 2004)”**.

(file: debacle7-22after9-11tragedy)
[5] Appendix V: Materials associated with proposal on creation a new U.S. Requiem Memorial Museum in adjacent to the National Mall in the Washington D.C. (file: e-mail – personal letter to Senator Lugar (on US Memorial) with the copies of materials on US Requiem Museum.eml)

Additions to VPS's WP, May 1, 2009

Dr. Dmitry A. Novik©

There are so many essential technological progresses having been made for 17 years from the time the original VPS's White Paper has been written and submitted. It would be quite reasonable, therefore, to adjust and advance some technological features of VPS technology and services, to elaborate more of the potential role of VPS as a new efficient, effective and highly convenient media for transmission, distribution, and custom by absolute majority of population the information of all sorts paper printed before and still paper printed till now.

Let's start from the list of the most important technological achievements, progress in TV and digital technologies from the 1992 that are very important for appropriate adjustments and advances have to be made for the VPS technology and services.

I. Starting from June 12, 2009 TV will become the Digital TV – DTV. It means that instead analog TV Standard NTCS will be in use the **new digital** TV ATSC Standard which prescribed in particular the **new format** 16:9 (instead 4:3 for NTCS) for TV pictures as well as **digital form** of TV signal for its digital generation, encoding, transmission, recording (writing & reading), decoding and analog visualization.

Transition from analog TV to digital TV besides increasing the visual quality of visualized TV picture means first of all increasing at least 4 times more available **independent digital TV channels** in the **same bandwidth** occupied before by only **one analog TV channel**.

II. Instead using in 1992 **electro-mechanical** digital memory devices based on floppy disks with restricted memory capacity of 1.4 MB for writing-reading digital files (digital TV signals including) later on has been designed and introduced instead floppy discs CD-RW with memory capacity of no less than 650MB, then after DVD for recording-reading digital TV signals with memory capacity enough for recording the whole video film with duration of time until 2 hours. Later on were designed and introduced **entirely electronic** digital flash memories with memory capacity until 16 GB (with price in the range \$20-30). There is no doubt that the memory capacity of the flash memories will reach its capacity for 32GB and might be more in the near future.

III. On the market you can find laptop DVD players and Roku digital players (with the price less than \$100) as well as so called e-books (with price around \$300).

IV. The essential progress has been made in PC and Internet high speed service that make it available in particular to search among WEB pages of the Internet and visualize text and graphic information on the screen of PC. Such kind of information services on PC and Internet dramatically evaporated the profit in the paper printed publishing business from paper printed newspapers, magazines, catalogs and many different encyclopedia as well as different sorts of reference books.

All these 4 main progresses and achievements in digital TV technology and systems as well as in PC, Internet, digital memory devices and DVD and Roku digital TV players, e-books are not at all eliminates the necessity of the design and wide reach

implementation of VPS technology and services but rather enforce potentially making such implementation as the most cost and functionally efficient and effective, imminent.

Let's explain at length such statement.

It is necessary to underline, emphasize first and foremost that VPS technology and services are **off-line** Video (TV) Publication Services like their analogs paper printed publishing products (newspapers, magazines, books, prospects, catalogs and so on) are also **off-line** publishing products with the time **delay** between original creation of the text and graphic information and delivery paper printed products with such information to end-user, customers.

Some of the paper printed publishing products like newspapers, magazines and some other publishing products received their profit mainly from publication on their pages advertisement information that paid by advertisement agencies that submitted their advertisements for publishing on the pages paper printed publishing products.

Such companies like Goggle, Yahoo received their profit for their so only called free at all from charge search of necessary WEB pages exclusively from those advertisement agencies that are buying their place on the pages of Google, Yahoo results of search. Let's underline that Google, Yahoo WEB search are not free from charge to customers of such search – first of all customers are paying directly for buying their PC and to providers of their high speed connection to Internet, secondly they charged all customers indirectly because advertisements on Google, Yahoo pages of search results cost extra money for companies that advertised their products by Google and Yahoo and that extra money increases the price of the products that are buying by customers.

As it was emphasized in original VPS's White Paper: *“Finally, let's remark also that the VPS generates a new, the most cost and functionally effective way not only to produce and **broadcast** effectively the TV advertising commercials, but really to use them by TV watchers-customers. This remarkable feature of the VPS potentially enables to change dramatically TV commercial broadcasting as we know it today breaking up, as a matter of fact, the necessity itself consolidate TV commercials with TV news, sport and entertainment programs in one fused TV programs. As it will be explained later on, such separation, in TV cannels and time, ‘**divorce**’ between commercials and TV news&sport&entertainment programs benefits both branches of TV services, TV watchers – the customers of these two potentially **separable** branches of TV services.”*

Let's elaborate farther on that very important feature of the VPS service based on the new horizons opened for VPS by the progress in TV technology and digital technology in general.

But before that let's define and select which variant of the ATSC digital TV Standard is better suited for VPS. That ATSC digital TV Standard prescribed the big assortment of different vertical and horizontal resolutions, different frame aspect ratio, different pixel aspect ratio, form of scanning and frame rate (see the Table of the ATSC Standard as Appendix A).

Let's first select the best, the optimal variant of the ATSC Standard for using in the VPS. Such variant is:

720	1280	16:9	square	progressive	60
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Selecting such variant supports the best conditions for **reading the text** information (as well as picture information) from the screen of VPS.

In the comparison to the NTSC Standard it means that the transition to such variant of the ATSC Standard increased the number of text information pages practically (each standard text page is represented as one ATSC TV frame) at least **4 times!** It means in particular that the speed of the transmission the publishing information in VPS is $v_{vp} = 60$ pages/second, or **3600** pages/minute, or **216,000** pages/hour!!!

The price of the delivery for one **VPS's** TV page may be calculated on the base of the price for the delivery of the one TV frame. For the case of the cable channel subscriber the price for one TV frame will be

$$c_{vp} = 4.5 \cdot 10^{-4} \text{ cents/TV frame or } 0.0009 \text{ cents /TV frame!}$$

Such price even more than **10 times cheaper** than the price of the one sheet of **clean paper without any printed (inked) information (text) on it!**

Let's mark and remind that these figures for v_{vp} and c_{vp} are received in assumption that the **VPS** technology is based exclusively on the existing **analog** TV technology not using **digital** image data **compression** methods and techniques for the reduction of the essential **intraframe spacial (positional)** redundancy which is so much characteristic for a still image of the publishing products like text page. In the case of using the digital image data compression technology, for example like the **JPEG** Standard¹, the data compression ratio for the images of the video publication may be evaluated in the range of no less than **20:1**. It means that by the transition to digital TV technology and image data compression technique, particularly, these figures will be additional at least **20** times more profitable for the **VPS**. Such using of the image data digital compression technique for the reduction of the intraframe positional redundancy of the publication **VPS's** TV signal means in a reality much more than only quantitative gain (benefit), it will give some very important qualitative change of the **VPS** technology like more simple and cheaper digital video memory devices (with smaller memory capacity) and the possibility to spread widely the **VPS** using it for more and more kinds of publication products.

Well, now let's consider the issue and the possibility of the **separation, 'divorce'** the commercials TV and news&sport&entertainment TV programs by introducing VPS. First of all it is necessary to underline that the 30 seconds TV commercials' clips within news&sport&entertainment TV programs as advertisement products are very poor advertisement quality and did not give enough detailed information on the advertisement products, not enough time to read and recognized small print text accompanied advertisement TV 30 seconds clip to impress TV watcher to buy the advertisement product. For example, let's consider advertisement of some medicine (drug) on TV – the most advertised products – there is no **necessary text** information about that medicine in according 30 seconds TV advertisement clip (advertisement of the same medicine in paper printed magazines such necessary text information is printed). Using celebrities and pretty sexy girls as actors in such advertisement TV clips has nothing to do with supplying the absolutely necessary information about the advertised product for TV watchers and potential buyers-customers. The sport, films celebrities participating in such advertisement TV clips, unfortunately, only increased the charging, the price with which

¹ Another kind of image data compression technology very much matches the specific of the statistical redundancy of the text page image is so called run-length image data compression technique.

customers need to buy these advertised products because advertisement agencies paid multimillion bonuses for these celebrities.

Potential separation, 'divorce' TV commercials from news&sport&entertainment TV programs is existed, as it was mentioned in the initial White Paper written in 1992, even with TV NTCS Standard time if to choose the night local time to transmit VPS program by commercial TV local stations that they were transmitting in the daytime (from 5 AM till 12 PM) their news&sport&entertainment TV programs. That is especially appropriate to make on the local PBS TV stations **without any charge, free** for public².

Transition from NTCS Standard to digital AT SC makes such potential separation, 'divorce' between TV commercials and news&sport&entertainment TV programs more reasonable because such transition provides for each TV stations the possibility to transmit at least 3 more additional independent digital TV channels (programs) in the same bandwidth of radio spectrum that was occupied before by one analog TV channel. And such divorce is **win-win** situation for all participants of TV broadcasting – it eliminates the commercial, advertisements 30 seconds TV clips from the main news&sport&entertainment TV program, VPS provides the really meaningful TV advertisement when each advertised product beyond picture or TV clip accompanied by the **full text** information (in the range of 1-5 text pages³) about the **all** features of that product, the text information that is especially important and absolutely necessary for VPS watchers, potential buyers of that product; and it is especially profitable finally for TV watchers of the news&sport&entertainment TV programs that would be not interrupted by commercials⁴.

Let's underline that transmission by VPS for VPS TV watchers-readers text and graphical information that was previously delivered to reader-customers in paper printed form like newspapers, magazines, catalogs, manuals, reference and text books for students of the local universities and colleges, official text information from Federal and local Governments, others socially and politically important text and/or graphical information in its TV (VPS) form provided for the public by Video Publication Service, New Interactive TV Public Services will create the new industry and products of TV (Video) Publishing Houses, TV Public Libraries, Personal TV (Video) Books.

Potential impact of such new VPS industries and products on the political and social life and environment is enormous.

² Basically, it the same off-line regime used for preparation and printing the paper printed newspapers at night time with delivering to read by reader-customers in the morning.

³ It means that VPS would be able to transmit for only 1 hour broadcasting VPS time no less that full text features information of the advertised products for more than 200, 000 products!!!

⁴ When editorial board members of the national published magazine PARADE asked in January 2005 their Contributing Editor Norman Mailer—one of nation's foremost writers and social observers—to answer the question: If you could do **one** thing to change America for the better, what would it be? Mailer's "**one** thing" was his suggestion-advice - "*a ban on TV commercials*".

Appendix A

Resolution		Aspect ratio	<u>Pixel aspect ratio</u>	Form of scanning	Framerate (<u>Hz</u>)
Vertical	Horizontal				
288	352	4:3 or 16:9	non-square	progressive	25
480	640	4:3	square	interlaced	29.97 (59.94 fields/s) 30 (60 fields/s)
				progressive	23.976 24 29.97 30 59.94 60
	704	4:3 or 16:9	non-square	interlaced	29.97 (59.94 fields/s) 30 (60 fields/s)
				progressive	23.976 24 29.97 30 59.94 60
576	352	4:3 or 16:9	non-square	interlaced	25 (50 fields/s)
				progressive	25

	480	4:3 or 16:9	non-square	interlaced	25 (50 fields/s)
				progressive	25
	544	4:3 or 16:9	non-square	interlaced	25 (50 fields/s)
				progressive	25
	720	4:3 or 16:9	non-square	interlaced	25 (50 fields/s)
				progressive	25 50
720	1280	16:9	square	progressive	23.976 24 25 29.97 30 50 59.94 60
1080	1920	16:9	square	interlaced	25 (50 fields/s) 29.97 (59.94 fields/s) 30 (60 fields/s)
				progressive	23.976 24 25 29.97 30

Good morning, my name is Caron Gala Bijl and I am Coordinator of the Agriculture and Food Research Initiative Coalition or AFRI Coalition. The Coalition is a group of scientific societies and organizations with interests spanning the biophysical to socio-economic sciences, ranging from biotech to organics and from nutrition to rural development. The Coalition is dedicated to

- increasing the awareness of science in the USDA's Agriculture and Food Research Initiative competitive grants program and*
- full authorization of this program at \$700 million.*

In '09 AFRI was funded at \$202 million; it is a small program when compared to other federal competitive research accounts. Yet, AFRI research, education, and extension is the missing link for enabling food security around the world, adapting our agricultural systems to climate change, and allowing for sustainable production of biofuel feedstock. AFRI has potential to solve problems and for growth. For example, in the FY 10 appropriation, AFRI received a 30% increase, evidence of its potential.

Thus, as you are charged to outline how to best enable science and technology in foreign policy, our Coalition proposes that the U.S. use AFRI to advance the adoption of technologies and practices that meet the needs of small-scale farmers around the world.

No doubt it is a grand challenge to meet the world's growing food and nutritional demands, while also maintaining or increasing the quality of critical ecosystem services. The AFRI Coalition argues that these goals can be achieved through the application of the full spectrum of agricultural sciences. Classical/public plant and animal breeding, livestock management, soil science, food and nutritional sciences, plant and animal biotechnology, as well as agricultural economics and rural sociology all have a role to play. Together these sciences, informed by local knowledge will develop effective approaches for international research and extension services.

Regarding "A New Biology for the 21st Century"—the AFRI Coalition believes that priorities for improving and developing the plant sciences to address food and energy security, include the full spectrum of plant development tools from genomics to plant breeding as well as other field-based methodologies. Training the "next century of biologists" in the full spectrum of the plant development sciences is a critical step to maintain our plant information systems, retain classically bred plant races, and advance new technologies in plant genetics.

Related to ecosystem service sciences and associated measurable metrics, we encourage PCAST to again look to USDA. The AFRI Coalition finds that leveraging the scientific knowledge at USDA to compliment the expertise available in other agencies will best enable the U.S. government to develop the metrics needed.

Finally, the AFRI Coalition encourages PCAST to urgently adopt a framework of multi-agency cooperation that includes the USDA. It is only with interdisciplinary and well-integrated research, education, and extension that we will succeed in finding the necessary solutions.

Thank you for the opportunity to speak.



October 23, 2009

Good morning. The Agronomy, Crop and Soil Science Societies appreciate the opportunity to comment before PCAST today. My comments are associated with the ambitious, proposed ***A New Biology for the 21st Century: Ensuring the United States Leads the Coming Biology Revolution (New Biology Initiative)***.

*My first point, really an observation, is why wasn't USDA included, along with NIH, NSF and DOE, when initiating this project? Along with the other biological sciences, the agricultural sciences, especially the agronomic and crop sciences, have an important role to play finding solutions to the major societal problems or challenges of food security, environment protection, sustainable renewable energy production and health identified by the Committee on a New Biology for the 21st Century. That being said, we encourage the National Research Council to strive to include, along with the physical and computational sciences, mathematics, and engineering sciences, the Department of Agriculture and representatives from the agricultural sciences, in workshops and other activities related to the New Biology Initiative in the future. We also suggest that the NRC's Board on Life Sciences reach out to its sister Board on Agriculture and Natural Resources which is responsible for organizing and overseeing studies on issues of agricultural production and related matters of natural resource development, including forestry, fisheries, wildlife, and land and water use.

*Second, we agree with the Committee that the New Biology Initiative offers the potential to address questions over long temporal and broad spatial scales and with a focus that cannot be undertaken by any single scientific community, agency or sector. This will certainly be the case as agronomists, crop scientists, ecologists and soil scientists, among others, continue work to gain an in-depth understanding of complex natural and managed ecosystems. **Agroecosystems** in particular, which make up more than **900 million acres or about 41% of the US land area**, would benefit from such large-scale, multiagency, multidisciplinary efforts. Obtaining such an in-depth understanding, especially of the 400 million acres of intensively managed croplands in the Corn Belt, Great Plains and other regions, which undoubtedly impact natural ecosystems, is critical for land managers to achieve sustainable yields of food and energy crops while minimizing environmental impacts. This understanding will be especially important as the climate changes.

Thank you again for providing the agronomy, crop and soil science societies the opportunity to speak before PCAST.

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BACK TO BASICS IN THE AFTERMATH OF THE TRAGIC EVENTS SEPTEMBER 11, 2001

Dr. Dmitry A. Novik©

The tragic, horrible, deadly, vandalistic terror acts September 11, 2001 committed by international organized and conspired groups of terrorists in New York and Washington DC have **direct** and unshakable influence on the absolutely necessary immediately follow up steps not only to find all individuals, groups, and countries who prepared, trained, supported, and inspired those 19 terrorists-kamikazes, to punish all inspirers harshly without any compromise or negotiations and with all available military might of the United States and its allies. There has to be found also and implemented all preventive political, management, logistic tools and means supported by corresponding innovative absolute secure, effective and efficient identification (authentication) technologies that will make impossible any success for international conspired groups of terrorists of any scale on the sovereign territory and airspace of the United States and its allies in the future, forever.

The organized conspired international terrorism has to be completely defeated and eradicated from the international life, international relations among the sovereign states. The United States has to lead his allies in demanding ultimatums to surrender has to be confronted to all terrorism organizations and states that nurtured and/or harbor these organizations which openly or secretly proclaimed to achieve their different political, economical, nationalistic, religious goals by violence, atrocities against innocent population. If the ultimatums are rejected then they must be destroyed using all available powerful military might of the United States and its allies, its allies in NATO first and foremost.

And it is no doubts, at least in my mind, that our civilization of free world, the coalition of highly developed countries first and foremost marking these tasks with the highest priorities can and must finally to solve these tasks forever. The examples of achievements by these countries in the responds to the no less challenges of the Second World War as well as Cold War, the challenges in nuclear and rocket sciences and technologies raise not only the hope but rather the confidence that these new challenges of the last World War, the World Fight against international terrorists in security arena can and will be solved very soon.

But the bitter lessons from the tragic events September 11, 2001 must go far beyond simply suppressing and eliminating any chance to succeed for any attempts of acts of international conspired organized terrorism. The **indirect** influence of tragic events September 11, 2001 has to be seen as the alarm bell of the necessity to understand the roots of our temporal weaknesses, to go back to basics, to rethink fundamentally why political and social fabric of this Nation, its domestic policy and policy of international relations are failed to prevent the success of that horror.

Not only citations from Bible or Koran contain wise advice for our life with all our problems. The screened by centuries of experience the folks wisdom is reflected in

popular maxims. To remember and remind them is quite useful in the time of crisis. The popular American maxim says: “*No pain – no gain*”. Terrible and severe national pain, unfortunately, has been done. Now, it is time to create national gain. As popular Russian maxim says: “*There was not fortune then misfortune helped*”.

Another popular Russian maxim says: “*Rely on God but do not fail yourself.*” Now it is not the time, of course, for finger pointing whom to blame personally that these terror attacks were not prevented and permitted to be executed inside the sovereign territory of our Nation by intervention of a small group of terrorists and their organizations and supporters. Time will come when thorough analysis of all the facts by special investigation commission assigned for that mission by the Congress will show and prove in details why these horrible terror attacks had happen September 11, 2001. Nevertheless, one thing is absolutely clear today, right now. And it is that, unfortunately, our Nation, all its institutions of public services - the executive, legislative, judicial branches of the Federal Government, the media – even each and everyone of us, citizens of the United States of America to some and different degree of personal responsibility and guilt failed miserably being not able to predict fully, to prevent, to detect preparedness of these terror attack, to seed necessary and sufficient alertness to public, to use all our intelligence, military and law enforcement might supported by spending around half trillion dollars budgetary money annually for secure and safe protection American citizen here in the United States and abroad. It is the most regrettable and truthful fact.

Let’s to be honest with ourselves at least and to look that bitter truth right in the eye. Well, no one is perfect, no one is free from mistakes but the worst thing to do is not to extract the right lessons from the tragic events September 11, 2001.

So, to find and to formulate these lessons, to suggest and discuss necessary corrections we need to start first of all from the very probable suggestions for reasonable explanations why these horrible terror acts were executed in September 2001, not other time, why international terrorists were able to select and implement that kind very powerful tools-weapon not another on the territory and airspace of the United States.

The professional international terrorists, selecting the timing to execute these horrific terror acts and the kind of the most powerful and the least expensive available to them tools-weapons for these terror acts, took advantage to the maximal degree of well evident mistakes of our institutions, our temporally weaknesses, our temporally wrong priorities in domestic and international policies.

First – the timing. There is some reasoning for such selection. Let’s start from the, unfortunately, unwelcome fact of our real political life that the transition from the previous Administration to the next new Administration, especially when these two Administrations represent different, opposite party affiliations, the transition as it is routinely implemented, is potentially all the time the **weakest** period for the new Administration and the country in the whole. It is especially true in the first year of the new Administration when the formation of the Cabinet, its other political appointees was not completed for many months if not the entire first year of the new Administration. It is especially true when the beginning of the transition period aftermath the national election in November 7, 2000 was to the maximal degree complicated by some lack of clarity of the results of the presidential election from the day of election in the beginning of November 2000 till the second half of December 2000. It was especially complicated by

the manner how that haziness was solved by unconstitutional interference by the Supreme Court when the result of elections by free will of millions of the citizens-voters was substituted by the result of vote by 9 members of the Supreme Court alongside parties' affiliations among these members. Plus usually September is the crucial and decisive time for finalizing the budget, its Appropriations bills for the new fiscal year that starts from October 1, the time when Administration, Congress and media is mainly preoccupied with such very often controversial and hot in arguments domestic agenda. Plus the August is the time of the long month vacation for all members of Congress and the main players of the Administration headed by the President. President G. Bush in particular decided to use his first and the longest the whole month vacation in August 2001.

The timing of international terrorists' attacks in September 2001 was also extremely facilitated for terrorists by the kind of the highest priorities in domestic policy and especially policy in the international relations that preoccupied the new Administration before September 2001. We all are witnesses what has happen. For some not to the end clear reasons the new Administration decided to use as its motto in public life – do it not only different but quite opposite to what has been done by previous, Clinton's Administration, change radically the highest priorities in domestic policy and policy of international relations. And it is all in spite to the undisputed fact that for the 8 years of previous, Clinton's Administration it was steady improvements in many crucial sides of economical, financial and social life for the United States and its population, steady improvements in international relations of the United States of America with decisive majority of other foreign countries.

Let's begin from the radical changes in the highest priorities of the international relations proclaimed by new Administration. There is a list of them but at the top of it is a clear initial – until the aftermath of tragic attacks September 11, 2001 - tendency of isolationism and unilateral, one-sided steps on international arena. Examples, corroborations? There are lot of them. Let's mention only two among them especially important and notable for international terrorists-attackers. Without any in advance groundwork consultations with our strong allies, first and foremost NATO members, President Bush vigorously pushed and was preoccupied by his Administration's all-embracing **National** Space Missiles Defense System as its **highest priority** to defend in the **future** of the United States and its population from the threat and blackmail the United States from such rogue states like North Korea, Libya, Iraq, Iran, Sudan and other real and potential states-adversaries having powerful and long range space missiles with nuclear warheads capabilities. Such push especially was intensified in August and the beginning of September 2001. Next is President Bush's super active unwillingness to directly and personally lead the peace negotiations between State of Israel and Palestinian Authority of Yasser Arafat, Syria as well as Syria's vassal Lebanon in spite of the severe and mounting atrocities ignited by the intifada, the intifada that followed up after Yasser Arafat left Camp David peace negations in July 2000, negotiations nurtured by personally devoted to this peace negations former President Bill Clinton, rejecting broad concessions offered by then Israel Primer Minister Ehud Barak without any his own, Yasser Arafat compromise counterproposals.

It was noticed also by leaders of terrorists, deciding to start the horrible attacks on New York and Washington DC in September 11, 2001, the preoccupation for the

domestic agenda in August 2001 by President Bush, Congress and media with super intensive discussion and political decision-making on the generally quite sophisticated, scientific and to some extent problematic euphoria on the theme of federal funding for the embryonic stem cells in medical research. President Bush gave his super highest priority to that theme as such that in the middle of his August vacation decided the first time in his Presidency to address and appeal to the Nation on TV by explanation and education American population about the moral aspects and grounds of his decision on that problem. And it is in spite of the facts that at **the same time** the conspired and well organized international terrorists finalized their preparations and preparedness intention of openly promised pompous attack on America and its citizens here on our territory and abroad, intention sufficiently known for the leadership of CIA that briefed each morning the highest echelon of the Administration on security issues.

As it is well known, the real politics and policy driving it is the art of affordable rather than the unrestricted dreams of fantasists. The Administration had seen the main threat to the United States and its population not now but rather only in the future, no earlier than 5 years on the road after, from a tiny number of missiles with warheads of mass distraction falling from the deep space on the American soil and its population. And the highly skilful leaders, well and successively educated creators of horrific attacks on the United States without any doubts noticed such kind of mood and preparedness of the Administration.

Now, why the terrorist leaders have chosen to hijack jet airplanes of American airlines departing from main international airports on East coast to the far away main international airports on the West Coast. Using airplanes as a manually directed by kamikazes targeted powerful weapon of destruction is nothing new from the time of using such weapon at Pearl Harbor. What was new is empower such weapon to the maximal degree by using jet airplanes fully filled by many tons of fuel. It is why they have chosen domestic air flights from the nearest for their targets international airports on the East Coast flying to destinations on West Coast. The terrorists knew and checked many times by preliminary flying back and force the weakest possible protection of borders of souvenir territory of the United States at its international airports for domestic flights, the noticed inadequately controlled way how the visas to visit the United States are issued, the absence of tough examination and detection the false identification documents, practical absence even routine checking of air travelers' ID's on domestic flights contrary to international flights abroad. The terrorists were encouraged also hearing that the Administration intends to forgive the massive illegal immigrants from Mexico legalizing their status in the United States.

As the result - tremendous success (sorry to use such words) that was accomplished by conspired organized groups of international terrorists in their evil attacks September 11, 2001, the attacks that took unawares the officials of the highest ranks and led by them institutions obliged to provide security and safety of the United States of America and its population.

So, returning to the quoted above maxims "*No pain - no gain*" and "*There was not fortune then misfortune helped*" we see that the impressive pain was achieved. Not only our Nation but the whole our civilization of free world were tragically misfortune. Now, aftermath these tragic events we all, our generation which went through and survived not only can but must for the sake of the memory the innocent victims of atrocities on

September 11, 2001, all future generations to find out and implement all necessary and sufficient means and tools that will make real to claim “**NEVER AGAIN!**”. And that cannot be achieved without checking our basics, seeing the forest behind the trees so to speak, understanding what were and are wrong fundamentally in legislative regulations and execution, implementations of these regulations have to be followed from the basic statements of the Constitution of the United States of America which we all, citizens of that Nation swear to preserve, protect and defend.

The Constitution is in its compressed and laconic form prescribed the rule of law of the relations between all branches of Federal Government and individuals, citizens, the free associations, religious in particular, that citizens have the right to establish and cherish.

The unshakable goals of our Constitution are “*to form more perfect Union, insure domestic Tranquility* [it means to be free from disturbance, domestic instability], *provide for the common defense, to promote the general Welfare, and secure the Blessings of Liberty to ourselves and our Posterity*” [it means to future generations too]. The Constitution in very general and laconic forms, in some its requirements open to interpretation, sets the minimal number of necessary restrictions in ways to achieve these goals, the restrictions that lead and govern the Federal Government branches and citizens public activities.

The first such fundamental restriction is decisive mutual separation religion from the state business, prohibiting the establishment of any official and exclusive religion or sect. Such restriction, prohibition defines the United States of America as the freedom democratic **secular** state contrary to inevitably repressive totalitarian **clerical** states. It is necessary to emphasize that those totalitarian regimes and states inevitably create a cult of supreme leader, such cult idolizes supreme leader even if formally the state is not religious in standard terms. Let’s remind in this connection the cults of such despots as Stalin, Hitler, Mao Tse-tung, Kim Il Sung, to name a few. The whole history of our civilization as well as its current standing is the most vital and unmistakable corroboration of the extraordinary wisdom of our Founder Fathers established such fundamental restriction in our Constitution. We are all witnesses quite recently how dangerous might be the political ambitions of the Christian Coalition or the Nation of Islam in our own freedom loving country. Do not forget that the former Speaker Newt Gingrich and his lieutenants in Congress tried to emulate in our time biblical 10 Commandments and new messianic mission under the flag of their “Contract with America”.

The President, the Congress, the Supreme Court, each and every citizen of the United States must strongly, scrupulously, and solemnly preserve, protect and defend such fundamental restriction of our Constitution. From this point of view some features of our tradition of inauguration procedure of the President and swearing procedures for all other civil officers from the Presidency and down are not perfect and need some corrections. Traditionally the future President in the inauguration procedure put his hand on Bible. But what if the future President is Muslim, for example, or nonreligious at all - there is not any restriction on kind of faith or establishment some definite kind of faith for any candidate to the Presidency in our Constitution. Therefore, the future President at his/her inauguration has to put his/her hand on the first print of the Constitution borrowed from the National Archive on this occasion instead Bible. The President must precisely

pronounce the words of his/her swear written in Constitution **without adding** “*help me God*” (remember the maxim “*Rely on God but do not fail yourself.*”?). The President and all aspirants to the Presidency have to be very careful in their public statements not allowing to use their statements in any way to be interpreted as the preference some specific religion or sect. From that point of view the respond from President, then Governor Bush in his election campaign on the question who is his hero, aspirator, unfortunately, feed suspicions because he was not able to note and mention **anyone** from 42 predecessors, former Presidents pointing instead to Christ.

Next is fundamental restriction. Originally and until Amendment XXII was adapted in 1951 our Constitution had not any restriction at all on the available number of terms to reelect the same citizen to serve the Nation as its President thus free any citizen who has born in this country, who reached the age no less than thirty five and has been a resident within the United States no less than 14 years – they are the **only** restrictions that Constitution initially until 1951 governed to use - voluntarily to submit or withdraw his/her candidacy for the election on the **next** 4 yours term of the Presidency. Let’s remind that our legendary President of the beginning of previous XX century Theodore Roosevelt **voluntarily** went to retirement after two uninterrupted and very successful terms of the Presidency and some years later after in 1916 submitted his candidacy again to be elected but lost that election.

Amendment XXII was initiated in the Congress dominated at that time by Republicans as an angry reaction to the fact that their strong opponent and Nation legendary President Franklin Roosevelt was severely ill serving his fourth subsequent term of the Presidency. Instead to put a new restriction in the Constitution by its Amendment XXII Congress should legislate a reasonable regulation, the law that prescribes a necessary medical exam of any candidacy to the Presidency and the Vice Presidency prior the election (after official nomination by Conventions) in the Naval Medical Hospital with published then after purely medical verdict by its authorized medical commission. Such procedure has to be used **also** annually for **all** incumbent President, Vice President, U.S. Senators and Representatives of the U.S. House, members of the Supreme Court, federal judges after reaching their 70 years age (let’s remind that such medical exam is needed to renew driving licenses, to drive the country is obviously much more serious and more responsible journey). Such law would and should prohibit exploiting the executive, legislative and judicial branches of the Federal Government as surrogate nursing homes at the expense of taxpayers, the situation that is shamefully illustrated by the course of political life chosen and not officially confronted by U.S. Senator Storm Thurmond for example. He is not alone, unfortunately.

Amendment XXII robs our Nation to enjoy and benefit from the subsequent public service by successful, healthy, energetic two terms Presidents and their Administrations. There is no doubt, at least in my mind and as some polls have shown, that if Amendment XXII has been repealed timely the very successful, healthy, energetic, passionate to serve the Nation two terms President Bill Clinton would be purposefully and resolutely elected for the subsequent third term and the country might be able to escape from irresolute, wishy-washy cycle of Presidential elections 2000.

The last cycle of the Presidential and Congress election 2000 very vividly and thoroughly has shown many sides of the wrong and unhealthy for the Nation prosperity regulations of the federal election campaign, presidential election in particular, and the

follow up transition to the new elected President and Administration. The Nation's electorate, the citizens of the United States are not properly informed of the program platform of each candidate seeking the Presidency, practically unable to know and evaluate the personalities of the main players suggested by each candidate to the Presidency to lead the Federal Departments and Agencies of coming Administration if such candidate will be elected as the President, and, therefore, the voting citizens quite uncomfortable and indecisive enough to make their choice in Presidential election.

It is urgent, therefore, that the Congress initiates and legislates a law requiring from each candidate seeking the Presidency just **at the time of their nomination at primaries on Conventions** to publish a list of submitted and nominated his/her leaders of main Departments and Agencies (Cabinet) of the Administration accompanied by their Resumes. Such law for sure would make each and everyone potential voter-citizen more prepared for his/her decisive and well informed choice in election the President along with his/her Vice President and, therefore, his/her Administration Cabinet, will stimulate an active participation of voters-citizens in election campaign as well as in the election finally. In the same time such law to the maximal degree would ease and to the maximal degree shortened the process of confirmation at the elected U.S. Senate the politically appointed senior Civil Officers nominated by the elected President for the U.S. Senate consent.

Another weakest and disturbing side of our election campaign is wasteful and shameful spending huge of money in election campaign, the sum of money rising essentially from one election to the next one in the time when using TV became the main tool and engine of election campaign. The only who is profited from such campaign at the expense of American electorate (taxpayers) are TV commercial networks and lobbyists representing some fat of money groups of special interest in their dream and hope that such investment will be profitable for them after election. And they do. Do you need some examples? It is a plenty of them. The most stunning and dreadful example of the so called perks to waste of no less than half trillion dollars of public money is the Congress decision-legislation in 1996 to give for free from charge to commercial TV broadcast companies so desperately needed for the progress of telecommunication additional bandwidth for their so called second TV channel as the way and prize of the transition to digital free terrestrial TV broadcasting. This legislation as well as acceptance of the new digital Standard for free terrestrial TV broadcasting by FCC were pushed vigorously and forcefully personally by then former Speaker of the House Newt Gingrich and former Majority Leader of the Senate Trent Lott.

The real and decisively exhaustive reform of federal election campaign may be fulfilled on the way to give the exclusive right and obligation for **free from charge** live broadcasting in prime time for Conventions, all follow up pre-election debates as well as election itself to **Public** Broadcasting System TV stations in all 50 states of the United States of America making democratic election campaign and election itself free from any commercialization.

There are four main and crucial functions of the public service in the domestic and international arenas has to be provided by the Federal Government to the American people in their all kind of activities in order to achieve and support the goals proclaimed in preamble of our Constitution. And they are:

- i) the public system of promoting free enterprise and innovations,

- ii) the public health care system,
- iii) the public system of education,
- iv) and the last but not the least the system of providing and supporting public security and safety.

It is quite understandable that it is enough not to be strong or to fail in any one of them in order the appropriate functionality of all others would be endangered. Unfortunately, all four public system and institutions have shown their vulnerability. The tragic events September 11, 2001 and their aftermath tested and demonstrated vividly the weaknesses all of them.

Let's start analysis from the system of promoting free enterprise and innovations - an economical engine and promoter of the achievable high living standard finally. The Constitution declare in particular that the Congress shall have Power "*to promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries*". Such declaration of our Constitution was interpreted and transformed in the field of "*useful Arts*" and according "*Discoveries*" by the Patent Law which define the so called intellectual property and give the Federal Government the right to grant the Patents and protect the exclusive rights of the intellectual property for Authors and Owners of these Patents. As it is for now, the last Patent Law in force adapted by the Congress in 1999 gives the **monopolistic** rights for Patents' holders-owners without any restriction to the citizenship of these Patents' holders-owners not so to **produce their products** but rather to **restrict the right to compete** with these Patents' holders-owners on the territory and the market of the United States of America to all others in their **rightfully** intentions and attempts to produce these products cheaper. And such exclusive rights are protected independent to the kind of potential invented product for 17 years after the Patent was granted (issued) by the Federal Government publishing in the public domain the description of the Patent. It means that such main provision of the Patent Law in force contradicts to the principle of free enterprise that is the main engine for the decrease the cost to produce and prize to buy necessary innovative products on the market governed by such free enterprise principle. It is the main cause and reasoning that we have, for example, many kinds of too expensive medications on the health care market of the United States in the time when the same medications produced by the same companies of the pharmaceutical industry are sold much cheaper in other countries. As the result it is high rocketing spending for public health care system in the United States, unbearable burden for the budget, population, business, the financial crisis of Medicare and Medicaid in particular.

Behind the Patent Law is well intentional and done contract between Inventor and society, public represented in this contract by the Federal Government, to motivate inventors not to keep secret of the description how to produce the products of their inventions by publishing in open to the public Federal Register the description of all granted Patents. Such Federal Register is the enormously huge accumulated National knowledge, know-how database, the database for all future aspirators-inventors, thus providing the progress in "*useful Arts [technologies]*".

But as it was said the road to hell is paved by good intentions. Unfortunately, some main provisions of the Patent Law in force, that Contract instead to promote the progress and well being of the Nation, its population, to protect unflinching the sovereign

economical borders of the United States make this borders dangerously vulnerable and, therefore, might make unbearable damage to the economical well being of the Nation, even national security. Concerning the threat and harm from terrorists and international terrorists especially, such potential threat and real harm is open, we will say welcomed, unfortunately, legally in the frame of Patent Law in force. It is the real scenario of the worst that can and might happen. Let's say well educated and creative intellectually international terrorists had a chance to invent, for example, a new medication to treat the most dangerous and dreadful kind of cancers or medication-vaccine to immune from the AIDS. Then these "gentlemen" would apply to the U.S. Patent and Trademark Office in the Department of Commerce for the patents on such medications and corresponding Patents would be granted to them. Then for the next 17 years (!) **all** residents of the United States would be **deprived** from any chance to produce in the United States or buy in another country and bring on the territory of the United States such medications. No weaponry of mass distraction, no kamikaze, no illegal intervention on the territory of the United States. Everything is legal, everything is "kosher", right? Nevertheless the horrible damage would be potentially done not only to the three thousand innocent victims like in 9/11 horrible plow but to the **whole** population of the United States, the population-hostage of the wrong and dangerous Patent Law in force.

It is one illustration from the history to recognize how horrible such potential threat might be transformed to the real harm. On the eve of World War I the United States was behind other Nations to be equipped by air transportation and air force in spite to the fact that such transportation and weaponry tools were invented in the United States of America. Why? Simply because the Great inventors brothers Wrights who invented the airplane and had received the Patent for their remarkable invention and backed by Cornelio Vanderbilt money to establish Wright-Martin Aircraft held a virtual monopoly but have not enough management skills to produce their invention industrially. The Government finally recognized how dangerous such situation is and forced brothers Wright to sell license to produce airplanes to the Federal Government¹.

The Congress must change and correct the Patent Law in force. Is it simple, without the fight and legal battle against powerful groups of special interests (patent lawyers and pharmaceutical association in particularly)? Definitely it is not. But it is better to make that battle in the Congress now then to loose the battle in life later on against the most intellectually powerful terrorists.

Well, let's analyze next our system of the public health care also only on the same angle of the potential vulnerability from the dreadful and deadly threat from international terrorism if they would turn to use biological, chemical weaponry of terrorism. The terrible situation with anthrax recently illuminates our vulnerability enormously. Remember what Secretary Thomson recommended to the public what to do first if after "*hearing your body*" as he said you feel that something wrong. What to do first – hurry to **your** doctor, said Secretary. Good advice but more than 40 millions of residents of the United States are not ensured, they have not **their** doctors at all. Such advice from secretary Thomson vividly reminds the anecdote to the point - when Queen was told that the people suffered and they have not what to eat. Her respond-advice was laconic – let's they eat then cakes. It would be very funny if it was not very sad.

¹ It is quite remarkable that initiator of that move of the Federal Government was a young Assistant Secretary of the Navy Franklin D. Roosevelt – in the future our great President.

Now the Congress after announcement of the retirement Senator Phil Gramm from Texas, the main killer of the debate in the Congress 1994 of the reform of the public health care system initiated bravely then by Clintons is free to change that course of their opportunistic business and immediately to return to such debate and create a law of mandatory federal basic medical insurance for the **whole** population. It is when our health care system finally will become really **public** health care system.

Let's now analyzed again only from the same angle of the potential threat from the international terrorism our public education system. It is not necessary to invent the wheel again so to speak. Everyone knows that our **public** education system from elementary till high schools is broken. Starting from President Bush senior down all Presidents and aspirators to be elected President want to be the Education Presidents, "*to do something [?! – D.N.] about public education system, to fix it*". They had done "something" or done nothing at all but the problem only getting worse. Remember what suggested the revolutionary Newt Gingrich and his followers in the Congress? It's very simple. Their intention to start the fight against the big Federal Government – it is to eliminate, eradicate the Department of Education from the Federal Government at all, completely.

What are still not broken are the best Universities and Colleges, especially their graduate schools. But it might happen very soon. Why? Because if high schools can not supply with well prepared for college education enough number of well prepared students-residents of our Nation then the only hope to survive for college, graduate school education is to invite foreigners better prepared high schools students to colleges and universities especially for high, graduate education in science. You see, we can educate professionally not only pilots-kamikazes for future terror attacks but scientists too to design new more powerful tools and means for international terror. Invitation a huge number of foreigner students in our colleges and universities is wrong and dangerous not only from the point of view of the potential threat from international terrorists well educated and trained by us, the United States. It is no less dangerous from the point of view of well being of this Nation, the vitality of our public education system, the knowledge data base of innovations especially in high technologies, and, therefore, our future. The broken link between supply of well prepared students from our high school for follow up college, university education and the demand from these colleges and universities must be restored now until it is not too late. And the only way to make it is twofold – first to stop mass invitation of the foreign students for education especially in science, math, engineering in our colleges and universities restoring the feed back, market principle of the supply from the homeland high schools to the demand from colleges and universities in our public education system, and the last but not least is to **federalize** our public high school system and then go to the next level of public education – to the **public** community (vocational) college education as it was suggested earlier by former President Clinton. Such federalization is the only and practically real way to provide **equal** opportunity of excellent high education for all students independent to their states' residency in the country and income of their families.

Now let's analyze finally our system of providing and supporting public security and safety, the issue of national security. It is the most crucial service has to be provided to the public mainly by the Federal Government with support of States' Governments locally. By the way, it is the only public service among 4 main public services provided

and supported by the Federal Government that was tested and confronted **directly** by the tragic events September 11, 2001.

There are many fronts where the national security and safety for the public are confronted and defined. First front is exclusively domestic issues that associated and influenced by domestic policy of providing the security and safety on the sovereign territory of the United States. The second is associated exclusively with the international relations, international policy of the United States concerning its relations with all other countries and international organizations. And finally it is the front where the issues of national security are influenced both by domestic policies of the United States and a policies of its international relations together, indissoluble.

The main domestic issue of providing public security and safety overwhelmingly determined by the so called gun control policy and often quite controversial debate and interpretation of the Amendment II of our Constitution. There are three terms, the restrictions associated with and used in this Amendment that are the source of misinterpretation of the rights and obligations followed and prescribed by Amendment II *“being necessary to the security of a free State”*. They are *“a well regulated Militia”*, *“the people”*, and *“Arms”*. Do we have *“Militia”* now, not at the end of XVIII century when Amendment II was adapted? No, we have not. Instead we have in each free State well regulated and what is no less important well equipped local police force and National Guard. What does it mean the term *“the people”* in the contest of the rights and restrictions defined by Amendment II? Who are *“the people”* – U. S. citizens, or the United States residents – U. S. citizens and foreign citizens legally resided in the United States, or foreigners legally admitted visitors of the United States? And finally what is behind the term *“Arms”*? And no less important – what is cause, the reasoning *“to keep and bear Arms”*?

First - that reasoning. The issue is a reasonable and reliable answer on the fundamental question who have to support and provide **public** security and safety. The Federal and States' Governments with their strictly regulated military might, intelligent and investigative institutions, law enforcement and judicial might or individual citizens in their free will to use their own weaponry (*“Arms”*)? Especially at our time and not at the time when Amendment II was initiated and adapted. There were not then powerful four branches of Arm Forces, FBI, CIA, DIA, NSA, Secret Service, NIMA and on and on, police forces at any corner of the country. And the answer on this question is simple as the truth is – to provide and support public security and safety is the main obligation **exclusively** by the very powerful but well regulated might of the Federal and States Governments. If so then the right interpretation of the Amendment II meaning is direct and simple too – no resident or visitor of the United States who is not a member of the United States services bearing and under the military and police uniform and duties has the right on the territory of the United States of America and its airspace to *“keep and ware”* any weaponry other then restricted number of hunter rifles licensed to have individually by the municipalities police agencies where is the residence of individual.

To preclude misinterpretation of the Amendment II this Amendment must be repealed in the current ambiguous form and changed appropriately. Is it simple to make? Definitely it is not. But it is better to have legal battle with NRA and their powerful lobby support now than to loose the lives of innocent people, the victims of domestic terrorism later after.

What are the aspects of the policy of international relations of the United States with other sovereign countries and international organizations which are directly associated with the obligation to provide and support public security and safety especially threatening by international conspired terrorists and their organizations? The recent history and experience of such aspects is the best guide to find the right answer on that question.

First and foremost – the public security and safety to the maximal degree provided and supported in **peace** time when the United States is not provoked to fight the war with foreign country threatening the security and safety of the United States and its citizens. It means that the main task of the policy in international relations is to keep peace and to motivate urgently all other countries to solve the differences and conflicts in the international relations with other countries by peaceful negotiations. The necessary condition to do it and to achieve such peace is to do it not unilaterally but together with our allies and to spread the circle of our allies. But it is not enough. The supplemental sufficient condition from another side is to defeat decisively with all military might of the United States and its allies where and when their territory or airspace are invaded in spite of all undertaken attempts for peaceful solution of differences and conflicts between sovereign countries as it was done in the Gulf War. The military defeat without any negotiations and compromise, distraction of international terrorists organizations and the regimes of the countries that nurtured and harbor them, the organizations that do not recognized and obeyed either international law or any other than the law of hate, is the only sufficient component to eradicate international terrorism as international pirates were eradicated earlier on.

There are two kind of organizations in which the United States is collaborated fully with other countries to achieve and protect the peace, to protect security and safety of the United States and its citizens. The first one is the geographically defined compact organizations of friendly and united countries like NATO that was and is very successful in its peace efforts to provide and support piece and prosperity locally in the West and Central Europe. The United States under previous Administration led its NATO allies in using their military might finally and were able to liquidate military conflicts and atrocities on the Balkan.

Another international organization in which the United States is participated in the mutual efforts for international peace and stability is the United Nations. Unfortunately, from the very beginning the United Nations was not the union of friendly and united Nations-countries rather the unrestricted number of all sovereign countries on the globe with some of them very often not friendly at least at all to each other. The organization of the United Nations became as some sort of international club for dispute and political propaganda between not United but rather Divided Nations.

The initial charter of the United Nations was compromised between the United States and the former Soviet Union in Dumbarton and never was able to constitute fully good necessary and sufficient initial provisions to become the powerful and reliable instrument to support peace and prosperity for its members. The history of United Nations shows that this organization was not able not only to prevent any war conflict between its members but even to facilitate peaceful solution of any of these war conflicts. The best illustration of helplessness of the United Nation is what current U.N. Secretary

General said after tragic events September 11, 2001 “It is little what United Nations can do”.

Such helplessness of U.N. is directly defined in particular by imposed dictate from soviet dictator Stalin to establish the 5 permanent members of U.N. Security Council with their **veto** capacity, to eliminate the permanent U.N. military contingent, to prescribe the rule of the selection and nomination by consensus among the permanent countries-members of the U.N. Security Council of the candidacy for election U.N. Secretary General only from the representatives of the countries of the so called Third World. Such organizational restrictions of U.N. decision-making structure paralyzed before and still paralyzes the possibility to make U.N. as an effective instrument to provide and support security and safety its members, international security, safety and stability.

The dissolution of the former Soviet Union in 1991 and arriving on international arena and in U.N. as a permanent member of the U.N. Security Council the Russian Federation instead, irreversible democratic transformation of the Russian Federation under the leadership of its first democratically elected President Boris Yeltsin and then democratically elected President Vladimir Putin can potentially transform U.N. as an effective instrument for the **United** Nations if to concentrate the mission of U.N. on humanitarian mission to help promote and spread for all nations constituted U.N. the advanced education technologies, health care technologies, agriculture technologies, to supply and distribute humanitarian aid for the countries-members if natural disasters hit these countries leaving the mission of providing geographically local security and stability to political-military geographically compacted alliances like NATO in Europe.

Such transformed U.N. has to change dramatically according to changed main mission, modernize its structure in particular by abolishing U.N. Security Council, establishing new democratic rule of election Secretary General, changing the weight of vote on U.N. General Assembly proportionally to the financial support that each country-member U.N. provide to the U.N. budget. Secretary General of such modernized U.N. has to be personally involved as the main facilitator and participant of the peaceful negotiations in the cases when there are territorial conflicts between U.N. members. It requests to select and elect as U.N. Secretary General the politician, former head of country highly respected internationally, who has demonstrated his/her capacity of effective leadership in his/her native country and has shown his/her devotion to nurture peaceful negotiations. It seems to me that right now hardly it is possible to find for such role the better candidate than the former President of United States Bill Clinton.

There are also some aspects of the policy of international relations which are inseparable from corresponding aspects of domestic policies. Together they are very important in the fight to prevent international terrorism especially.

Among them are:

- a) the immigration policy and the policy for acceptance of the political asylums;
- b) energy policy; and
- c) the policy of protection the United States borders in its airspace.

The immigration policy has to be strictly followed the annually quota for immigration defined by the Administration with the consent of U.S. Senate. The acceptance of political asylums has to be changed dramatically by preventing to use this channel of temporal emigration in the United States as the safe haven for those seeking

the violent overthrow of the regime in their native country. The history teaches us that such kind of political asylums more often finally rather than seldom do more harm for their native country and national security of the United States.

Let's put two examples from the history for illustration. Vladimir Lenin and his followers-conspirators lavishly used political asylum status in West Europe in preparations to overthrow the tsarist regime in Russia. Of course the tsarist regime in Russia was oppressive and not democratic. But Bolsheviks plot to overthrow the Interim Government in Russia installed much more despot regime of the so called red terror in Soviet Union, interrupted the possibility of democratic evolution in Russia for more than 70 years. Ayatollah Khomeini and his clerics-followers has used the West Europe as the base in preparing to overthrow the regime of Shah. Did the Shah regime was oppressive? Yes, but the clerical despotic regime installed in Iran by Ayatollah Khomeini and his followers-clerics was and still is one of the most oppressive regime on the world, the regime of the rogue state severely threatening the national security of the United States. Clerical Iran is one of the main road stone on the way to achieve the stability and peace in the Middle East, the country supporting directly and through Syria financially and with weaponry some fractions of Palestine terrorism organizations.

Now the energy policy. In spite to the fact that energy policy of the United States is purely domestic policy such energy policy nevertheless for some specific reasons inseparable from a policy on international arena. That linkage depends from one side on the fact that energy consumption is directly associated with the level of industrial, agricultural, military might of each country, with achievable standard of living in general. From another side the leading natural energy resources like oil and gas are distributed unevenly among countries in such way that very often the supply of energy resources does not match to the demand of consumption of these energy resources. And finally the use of natural energy resources, especially oil, is, unfortunately, is associated definitely with environment damage by emission some noxious gases in an atmosphere. Such emission does not know the countries' borders of their airspaces thus transforming the quantity and quality of such emission as the phenomena of international relations too.

The United States consume more than any other country and more than 50% of oil supply is from another countries, mainly from the Middle East region, the most politically unstable region.

Unfortunately, some of the richest by oil resources countries organized intentionally an international oil supply cartel that is able to dictate the level of supply of the raw oil on the international oil market blackmailing politically the United States and some of its allies as it was demonstrated in 1973 oil crisis.

Therefore, decreasing the dependence of the United States from the foreigner oil suppliers is on the highest priority. There are two mutually complemented ways to achieve that goal – first to design and use more efficient technologies to use energy produced by burning oil and its products, and to increase domestic sources of energy supply. The potential possibility to increase essentially the oil supply from new domestic oil fields in the United States is very restricted by Mother Nature. The most environmentally cleaned energy source is electricity generated by nuclear energy plants and renewable energy sources like wind and solar sources. The United States has enormous potential to increase its energy resources by construction new nuclear energy plants because United States has a big stockpile of nuclear fuel that will be increased

farther as the result of essential reduction of its arsenal of nuclear warheads by mutually desirable and profitable agreement between the United States and the Russian Federation.

Additional mobile sources of electric energy are the electric generators working with nuclear reactors of nuclear submarines that in big numbers will be removed from the active duty in U.S. Navy. Such nuclear submarines with dismantling of their missiles and torpedo weaponry can be used on the ocean shoreline as the mobile energy factories. The big length of the ocean shoreline of the United States makes such mobile energy factories as very convenient and efficient type of energy supply.

As the result of essential increase of the electric energy generated by nuclear energy plants the United States will be able not only to reduce its dependence from the energy oil supply from foreigner suppliers but become potentially even the country which is able to export electric energy abroad in our hemisphere through the electrical grid.

And finally is the policy for protection the borders of the United States in its international airports and its airspace. Some of these airports are deeply inside the territory of the United States thus opening the airspace of the United States to the commercial airplanes of many foreign airlines. Right now there is not any possibility for the United States to participate in checking the crew and the passengers and cargo boarding these airplanes before their flights from the corresponding international airports in foreign countries. Such situation has to be changed as quick as possible by the policy of agreements with each of the foreign countries airplanes of which have as their destination the international airports within the United States to give the access to the United States for checking the crew, the passengers boarding this airplanes as well as a cargo and certified them **before** these airplanes are able to departure from the international airports in the foreign countries.

So, freedom from the international terrorism is really not free and freedom is not all permissible.

The tragic events September 11, 2001 have to be followed by decisive, exclusive and thorough **federalization** instead **commercialization** for those services to the American public that can be potentially the channel of penetration by international terrorists. The popular slogan "*Government of the people, by the people, and for the people*" must be converted for concrete deeds. **Our Government is not effective not because it is big but rather it is big because it is not effective.** To prevent any possibility of the innocent victims from the acts of international terrorism instead to fight physically with organizations of international terrorism after we must fight mentally, intellectually beforehand.

The famous Dutch physicist H.A. Lorentz said once: "*I am happy to belong to a nation that is too small to commit big follies*". We Americans are deprived from such opportunity. We do commit big follies some time. But we are happy to belong to a big and great Nation that has shown its capacity that we can learn and extract finally the right lessons from committed big follies to lead the free world in the right direction. It is better late than never.

The election campaigns in 2002 and 2004 have to be transformed from entertainment events to the very serious and crucial public business.

Hey, do not miss fortune that misfortune gave. Do it right and do it right now. As it was said – "If not we than who, if not now than when".

Thanks for reading and listening.

Dmitry A. Novik 10/25/01

P.S. Either you disagree or agree please call or write at your convenience to share with me your thoughts. Beforehand thanks.



Digital Imaging General

DIMAGE, Inc.

...dimage vs. damage...

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Gerry G. Meisels

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EDUCATION

Gymnasium, Vienna (Austria) 1941-49
University of Vienna, Chemistry, 1949-51; 1952-53
University of Notre Dame, Physical Chemistry, M.S. 1952, Ph.D. 1956

EMPLOYMENT HISTORY

University of South Florida, Tampa, FL, 1988 to present
Professor of Chemistry, 1988 to present
Provost and Vice President for Academic Affairs, 1988-94
Director, Coalition for Science Literacy, 1994 to present
University of Nebraska, Lincoln, NE, 1975-88
Professor and Chair, Department of Chemistry, 1975-82
Dean, College of Arts and Sciences, 1982-88
University of Houston, Houston, TX, 1965-75
Associate Professor, 1965-70, Professor, 1970-75, Chairman 1972-75
Union Carbide Corporation, Tuxedo, NY, 1959-65
Chemist, 1959-63, Assistant Group Leader, 1963-65
Gulf Oil Corporation, Pittsburgh, PA, 1956-59, Chemist, 1956-59

RESEARCH

95 research papers in reviewed science journals and 15 papers on education.
Science Research Subjects included Analytical and Fundamental Mass Spectrometry, Radiation Chemistry and Chemistry of Gas Phase Ions; funded by NSF, U.S. Dept. of Energy, Welch Foundation, \$1,450,000 over 24 years
Education research subjects include teacher characteristics, teacher turnover, and college science courses,
Education Outreach: Professional development and induction, teacher recruitment, program evaluation, science courses, statewide planning, and legislative initiatives; Current funding \$6,939,000 as PI or co-PI

HONORS

Fulbright Fellow
Science Research Fellow (UK)
Gordon Conference Chair
American Chemical Society National Science Policy Award 2001
Smith-Mundt Fellow
Danforth Foundation Fellow
Phi Beta Kappa

BIOGRAPHICAL LISTINGS:

Who's Who in America,
Who's Who in Science;
Who's Who in the South and Southwest
American Men and Women of Science

PROFESSIONAL

Florida Coalition for Improving Mathematics and Science Education (CIMS) 1998-present; Chairman, 1998-present; Interim Executive Director 1999-
Florida Higher Education Consortium for Mathematics and Science (HEC) 1994-present; Chairman, 1998-2000; Board member 1995-98, 2001-
National Alliance of State Science and Mathematics Coalitions (NASSMC). Board of Directors 2000-, Vice President 2006-08, President 2008-2010
Council of Scientific Society Presidents (CSSP), 1984-1995
Council Chair, 1991, Executive Board, 1988-92
Chair, Committee on Government Affairs, 1986-90, 1992
Chair, Task Force on Priorities in the Sciences, 1992-93
American Society for Mass Spectrometry (ASMS), 1969-1999
President, 1986-88; Vice President, 1984-1986, Director 1988-1990
Council for Chemical Research (CCR), 1979-1988; Board Member 1982-4
American Chemical Society (ACS), 1952-
Chair, Committee on Economic Status, 1980-1983
Society of the Sigma Xi, 1955 to present; President UH chapter 1974-5

May 11, 2009

Arne Duncan

U.S. Secretary of Education

arne.duncan@ed.gov

CC: Marshall (Mike) S. Smith, Ph.D.

Senior Counselor

to Secretary of Education

marshall.smith@ed.gov

Dear Secretary, dear Arne Duncan:

I have the privilege to be among listeners at today event in Brookings “A Discussion with Secretary of Education Arne Duncan” and I was very much impressed with your short, perfectly articulated and to the point speech and the answers on the questions in the Q&A session after your speech. What was impressed me the most your willingness to inspire discussion not only among panelists but also among listeners in over packed auditorium in the search of new ideas.

You left the event before panelists’ discussion started. On your way out from Falk auditorium I met you in the hall and gave in your hands prepared by me for you printed my material (4 pages) on the innovative idea how to radically improve education in public school and colleges (universities) because by the cherry picked selection the moderator G. Whitehurst deprives me from possibility to ask you the question in spite to the fact that I raised my hand from the very beginning of the Q&A session after your speech till the end of that session.

Unfortunately, the following your speech the panelists’ so called discussion was not at all of any discussion at all on innovative ideas how to improve education in public schools and colleges but was looks like the arguments between failing Wall Street bankers how to divide big money, big pie of approximately 6 billions from the Stimulus package appropriated by the Congress and signed in the law by President Obama.

Again, after the event is finished I spoke very shortly with your Special Counselor M. Smith expressing to him my disappointed with panelists’ discussion, gave my business card to Mr. Smith asking to give me his e-mail address that I would be able to communicate to you and him my comments and questions because moderator G. Whitehurst deprives me from possibility to ask the question to panelists in spite to the fact that I raised my hand from the very beginning of the Q&A session after panelists’ so only called discussion.

First time I wrote October 25, 2001 the paper-essay on the issue of the public school and colleges education from the national security and economic prosperity of the Nation points of view “BACK TO BASICS IN THE AFTERMATH OF THE TRAGIC EVENTS SEPTEMBER 11, 2001”, (16 pages – see especially pp.9 and 10) – I attach the copy of the paper-essay to this e-mail letter.

After that I wrote my letter “ONE IDEA THAT NOT ONLY MIGHT BUT SHOULD CHANGE AMERICA FOR THE BETTER” (3 pages) written in January 2005 in respond to the invitation from the editors of the national magazine PARADE. Magazine PARADE published in its June 26, 2005 issue the edited version of my proposal. Recently I added one more page to that text as well as my proposal “My proposals for higher education (in universities and colleges) within the USA”, (1 page) - I attach the copy of these 5 pages to this e-mail letter.

Next time I wrote September 11, 2008 letter-appeal (9 pages) to then still Senators Obama and Biden on the highest priority to make the USA strong again, for foreseeable future and times to come after by radical innovation in the public school policy - I attach copy of that letter-appeal to this e-mail letter.

I do not know what I need to add to all these sending to you materials rather than to remind the experience from the USA history how important and decisive care and involvement, encouragement, influence parents, grand parents and other relatives in the successful education their kids in public schools. The wave of Jewish immigration in the beginning of the previous century left Russia for America in attempt to save from the pogrom in Russia and other humiliation the human rights (in particular for education) for Jewish people in Russia. It is necessary to underline that immigrants from Russia were the poorest part of Jewish population in Russia. Arriving in the USA they work very hard for their low educated and low paid jobs inspiring and motivating their kids to be educated in free for all children the USA public schools. The next generations of Jewish immigrants after successive graduation from the public high school became after studying in higher education as doctors, engineers, scientists, artists, composers and other highly educated and creative professionals. It is the good lessons for today role of decisive involvement, encouragement, influence of the parents and other relatives of today kids for the successful graduation from the high public school. In XXI century the graduation from the high public (and privet) school is the **must**.

I understand that after reading sent to you materials there are might and should arise questions. It is my civic and professional obligation to answer them. The best way to do it is to arrange our meeting.

I hope to receive your speedy respond.

Sincerely and respectfully, with wish in success of your leadership,

I'm truly yours

Dmitry Novik



Digital Imaging General

DIMAGE, Inc.

...*dimage vs. damage*...

Dr. Dmitry A. Novik

4000 Tunlaw Rd., NW, #1130

Washington, D.C. 20007

Tel. (202)-333-8956; dnovik@verizon.net

1-2 July, 2009

Arne Duncan

U.S. Secretary of Education

arne.duncan@ed.gov

Dear Secretary, dear Arne Duncan:

I would like to attract your attention to innovative information technology of the personal video text book (PVTB) that I was lucky to invent as far back as in 1992¹ among other video publication services (VPS).- **New Interactive TV Public Services** [TV (Video) Publishing House, TV Public Library, Personal TV (Video) Book]².

It's well known how important the role of the different **paper** printed information (the paper publication products, service) in all kinds of human and society activities. These paper publication products are directly associated with the paper printing technology introduced still in XV century by Johann Gutenberg (1400-1486). The paper printing technology dominates publishing products market until the second half of this century when paper publication information starts to be disseminated also via telecommunication channels and networks by according electronic signals and digital files.

The FAX technology first converts paper publication products to according electronic signals and utilizes public telephone lines as a way for electronic global wide dissemination, distribution of the paper publication products. Unfortunately, this FAX technology is none interactive and expensive way of the on-line service for delivery of the none color, none perfect image quality paper publication products to remote clients, end-users. The next important steps were on-line interactive service from a remote text/image data bases-servers (like Microsoft, Google, America Online - for example) or from a myriad of text/image data bases connected via telecommunication network (like hypertext WEB pages on Internet) to the distant computer equipped end-users. In spite to the fact that these interactive computer assisted types of the electronic preparation, dissemination, distribution of the paper publishing products much more efficient and speedy than the FAX technology, they, unfortunately, also have some weaknesses. The most important among them – these interactive computer assisted technologies are still too expensive and, therefore available only to owners' computers and Internet access; they do not support the high image quality of the paper printed technology.

Generally speaking, the Video Publication Service (**VPS**) is a really **new**, not only publication, but also public TV service generated by a radically **new, completely interactive and absolutely friendly to customers, TV-watchers** TV technology and system carrying and delivering in a new electronic video, TV form **all** known sorts of publishing (printed) information (products).

¹ I made an application #08043921 for the U.S. Patent under the title "Systems and methods for video encoded publication distributions" at 04/08/1993.

² I attach two my papers – White Paper "**Video Publication Services – New Interactive TV Public Services** "[TV (Video) Publishing House, TV Public Library, Personal TV (Video) Book], 7 pages dated 04/03/1992 and "**Addition to VPS's WP, May 1, 2009**", 6 pages dated 05/01/2009 – that describe in details Video Publication Services and its different modifications and applications.

Additionally to the interactivity of the **VPS** which is extremely convenient for the TV watchers making easier to them **to read** the **text** information and to **look** at the **still** images adjustably to individual's speed of read and recognize, understand the text and still images of the TV publishing product on the screen of TV monitor the **VPS** is the most cost effective electronic media of the mass dissemination, distribution of the publishing information, publishing products for the absolute majority of population if to count the world the widest penetration of TV networks and practically unrestricted spread of TV sets among the globe population.

Even more than this – the **VPS** is able to generate a completely new publishing product which is impossible to generate by paper printing technology at all and too expensive to generate by on-line computer assisted service – it is the combination, consolidation, fusion of the text, still images, clips of motion pictures, and sound information in the most efficient, convenient, interactive customer-friendly, and cost effective form for TV watchers.

Let's emphasize also that the **VPS** is completely **compatible** with all existing TV standards because it generates the VPS's TV signal in the form of the **standard** TV format (after June 12, 2009 in the digital TV formats)..

Personal TV (Video) Book (PVB), and especially Personal Video Text Book (PVTB) is one of the might be the most important public application of the VPS. The general principal of the **off line** VPS of the text, graphic products (book, text book in particularly) is that the text information is **video encoded** as the TV standard video signal where the text information of the **one text page** is encoded as according **one TV frame**. It means in particular that VPS TV signal of any book is represented by the sequence of the TV frames corresponding to the whole sequence of the text pages of that book where each next TV frame-image is the image of the next text page.

The PVTB has some features that make the PVTB as the simplest and accordingly the cheapest among PVB in general. The main feature of the any text book is that the text of any text book is **the same** for the **whole year** of learning, in other words the text of the specific text book does not change at all (the same as for paper printed text book). Therefore, the PVTB does not need at all any TV tuner and any telecommunication with TV networks. It means that PVTB has the only following parts as TV set has: TV screen with according digital electronics–chips; digital MPEG/JPEG decoder; digital-to-analog converter that transforms the **digital** VPS encoded TV signal to the analog TV 3 RGB signals that control brightness and color for every pixel of the TV screen; and the outside the PVTB converter of the electric power AC voltage 110 volts to electric DC power with the voltage necessary to feed electronics (usually DC 9 volts); headphone jack.

What the PVTB has not in comparison to the TV set are: TV tuner; inside TV antenna; TV cable connector for outside TV antenna; specialized digital/analog processor for controlling many specific features of TV set like menu and menu selection, TV channel scanning and selection/adjusting, timer; infrared detector-receiver of the controlling signals from remote control as well as remote control itself; audio dynamics; rechargeable battery³. Additionally to mentioned above components common with TV

³ The absence of rechargeable battery in PVTB is for reason - VPS PVTB purposely does need rechargeable battery (it precludes to use VPS PVTB by the students in the parks, on the beach, in the transportation, in the rest room, in the bed and so on - the learning and study HAS TO BE ON THE DESK either in the school or at the student's residency because for studying student has to have specific

set the PVTB has digital read only flash memory chip in which is prewritten digital VPS signal for the PVTBs.

Let's calculate the memory capacity of that read only flash memory. With selected digital TV standard with 720x1280 pixels of the TV frame each VPS PVTB TV frame (VPS text page) has capacity of

$$M_{\text{TV frame}} = 720 \times 1280 \times 3 / 20 = 138,240 \text{ bytes,}$$

where: 3 – the number of RGB color signals;

20 – image data compression ratio for text image provided by JPEG lossless image data compression coding.

The standard flash memory with capacity 2 GB thus is able to memorize no less than

$$2 \text{ GB} / 139 \text{ KB} \cdot 14,388 \text{ VPS text pages.}$$

Even if each text book is no more than 200 text pages it means that read only flash memory with memory capacity 2 GB can memorize no less than 71 PVTBs!

Of course the number of text books for any education year for each student is no more than 10 different text books, it means that for the PVTB is enough to have the read only flash memory chip with memory capacity of no more than 281MB!

The current price for read/write 2GB flash memory chip is no more than \$16. It means that the price for the read only flash memory chip for the PVTB is in the current market would be no more than \$3 – so cheap would be the read only flash memory chip for the PVTB!

Let's now mention the size (diagonal) of the desirable digital TV LCD screen. It would be desirable to have the same size of the standard paper printed text book. That size is 9"÷10". With such size of the digital TV LCD screen the current price of the PTVB would be in the range of \$30÷\$50. With mass production of needed for the USA schools, colleges and universities of the order of no less than 30 millions PVTBs the price of the PVTB might be decreased farther.

Economical effectiveness and efficiency of the transition from paper printed text book is tremendous. It is necessary to note that the **only one, the same** unique PVTB would be serve for the no less than whole 12 grades of high education and additional 4 grades of higher education for each student! The only what is necessary to change with the next grade for the student is to change of the read only flash memory chip with prewritten digital file of the VPS TV digital signal for approximately 10 text books of the current grade to the next grade.

Beside tremendous economical effectiveness and efficiency of the PVTB student does not need to travel from residency to school (college, university) and back to residency with heavy back pack any more. The weight of the PVTB is smaller than 1÷2 pounds. The number of only trees necessary for production the paper to print text books that would be saved in the transition from the paper printed text books to PVTBs would have tremendous effect on the improving environment.

Let's also mention that the mass production of the PVTBs is the **new** high-tech industry within the USA with increasing employment for high-tech jobs in the USA is no less then about 100 thousands new high-tech workers.

environment - learning and studying with text book as well as with PVTB is the HARD WORK and not to have fun.

The USA not only might but should to be pioneer in the transition from paper printed text books to PVTBs. I would be glad if the USA Government would apply and receive the patents for PVTB in USA and other countries and sell the licenses for productions the PVTBs in many countries around the globe.

Mr. Secretary, I understand that after reading that letter and accompanied attachments there are might and should appear questions. It is my civic and professional obligation to answer them.

I hope to receive your speedy respond.

Sincerely and respectfully, with wish in success of your leadership,

I'm truly yours

Dmitry Novik



Digital Imaging General

DIMAGE, Inc.

...dimage vs. damage...

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**National Center for
Technological Literacy®**
Museum of Science, Boston

TO: PCAST, OSTP
FR: Patti Curtis
DT: October 23, 2009
RE: Oral Statement/Talking Points

Thank you for the opportunity to present this morning. Thanks for Administration's focus on STEM education, particularly in Race to the Top, and thanks to the staff for their efforts. We are also grateful for the Academies & Dr. Katehi's K-12 Engineering Education Committee for examining and bringing to light the excitement and promise of K-12 engineering.

The mission of the National Center for Technological Literacy is to advance K-12 Engineering education nationwide because:

1. engineering provides opportunity for integrative hands-on application of math & science,
2. it provides relevance and its fun,
3. when implemented in classrooms (versus self-selecting camps, afterschool clubs & competitions), it builds diversity: and finally
4. it builds technological literacy which is important for ALL students to be conscientious consumers, citizens, voters whether they pursue a technical career or not – K-12 engineering education must be mainline not just pipeline and Dr. Katehi noted.

At the NCTL:

1. we work with states in developing engineering standards and assessments (including NAEP Science and the new NAEP Technological Literacy assessment);
2. we create developmentally-appropriate, standards-based, and teacher tested K-12 engineering curricula funded by NSF and others that has reached more a million students;
3. we deliver pre-service, in-service, and online professional development (more than 15,000 teachers) in K-12 engineering at the Museum and in partnership with universities and other science centers in a more than a dozen states (MA, NH, ME, NJ, NY, OH, TX, NC, KY, WI, IN, AL, CO, MD)

Our work and research (including pre & post tests and control groups) shows the following:

1. Students that use our Engineering is Elementary curricula are more likely to know what engineers do (they don't just drive trains, nor do they fix engines) and that technology does not always require a battery or a power cord (things like band aids, running shoes and water

bottles are engineered products or technologies that improve the human condition). We are busting common misperceptions that prevent many kids from pursuing these fields.

2. Students who learn and work through the engineering design process and the related science, are more likely to correctly answer science questions than the control group with no engineering.
3. In a nationally controlled study, thousands of students who participated in our curricula and the related science content were compared with a control group with only the science content. The performance gap between low and high socio-economic status students was **significantly smaller** after exposure to the engineering curricula.

Four Macro to Micro Policy Recommendations:

1. PCAST should work to expand the portion of the federal STEM portfolio dedicated to K-12 programs. You heard the agencies report that a very small portion of their STEM funds actually goes to K-12 programs – most money goes to higher education programs. This immediate ROI – undergraduate and graduate fellowships produce a ready-made workforce for them, but leaves a huge pool of talent behind.
2. More specifically, we urge PCAST & OSTP to insure that all STEM programs really do support K-12 technology and engineering education – most only support math & science teachers and programs, to the exclusion of technology and engineering education and educators.
3. More proactively, we urge PCAST to consider supporting a grant program to help states explore, plan, and implement K-12 engineering, and funding for the proper evaluation of the impacts.
4. Finally, please remember that museums and science centers, in particular, are great community resources and should be made eligible to receive federal funds to provide teacher professional development and afterschool programs.

Thank you for listening.

ONE IDEA THAT NOT ONLY MIGHT BUT SHOULD CHANGE AMERICA FOR THE BETTER

It is very hard any time to find the only one, unique idea, corresponding legislation act and its execution that would change the United States of America for the better. Such One Idea – if it exists – has to be satisfied to at least 3 main conditions-criteria:

- it has to be targeted on the solution of the most critical situation for the USA and its population not only in the short run but in the long run, for foreseeable future;
- it has to be influential for the broadest spectrum of different aspects of economical, social and political life for the whole population of the USA;
- it has to be affordable morally, economically, socially and politically.

Such unique One Idea fortunately exists and it can be formulated as such incentive:

Each child who is born in the USA should receive to the day of his/her 3-year birthday from the Federal Government the gift of the check on 10,000 dollars that would be put on the name of that child in the 15 years bond issued by the Federal Government. At the day of 18-year birthday the child should receive the accumulated money from such bond if and only if the child and his/her parents have been matched to the following requirements – he/she has been enrolled in the all 3 levels of public schools and successfully graduated from public high school. In the case when such requirements are not matched the accumulated money from bond are put in a special Federal trust fund that can and should be used by the Federal Government only and exclusively to additional finance support of improvements day care services, pediatric medical services and public schools.

Let's now explain that such One Idea fully and comprehensively satisfies to all 3 criteria mentioned above.

- I. The Idea targets the most critical situation for the prosperity, national, economical and social security of the USA and its population, its citizens for foreseeable future.

There is no doubt that the current system of the public schools and education in the USA is, unfortunately, the most serious and influential crisis for the United States of America and its population, crisis that is so widely influential not only for today life but, what is no less important, for foreseeable future. The USA is on one of the last place in the list of 24 developed countries by the level of skills of the public high school graduates in science and math. The big percentage of the public high school students dropped the high school before graduation.

As the result the USA colleges and universities cannot fill up their undergraduate and graduate schools in science, technology, engineering and mathematics by the graduates from the public high schools of the USA what forces the USA colleges and universities to compensate such shortage by attraction foreign high school graduates to fill the gap.

The low average level of home high school graduates especially in math and science, the high percentage of students that are not graduated from home high schools

are the main reasons of severe shortages to fill job positions in high tech industries and in such crucial public services as modernized medical and military (national security) services. Attraction a high number of highly educated foreigners-immigrants to compensate such shortages - that is only the contradictory illusion of solution especially in the long run perspective - eliminates market oriented incentive to improve home public schools and education level.

Such shortages are direct threats to the national and economical securities of the USA in the XXI century with dominant role of the high tech industries and services in economical and social life.

II. The Idea is capable directly and indirectly to influence to the maximal degree the broadest spectrum of different aspects of economical, social and political life of the USA and its whole population.

The Idea provides direct effective and efficient financial, material, market oriented incentive for students in public schools, and what is no less important, incentive for their parents', families' involvement in prioritizing the goal of successful education and graduation their children as the students in home public high schools. Such prioritizing and material, financial incentive without any doubt would further essentially the level of education in the public schools and would increase the percentage of the successfully graduated students from our home high schools.

Accordingly the USA colleges and universities would have sufficient pool of the high educated graduates of the home public schools to attract the best of them for undergraduate and graduate education in science, technology, engineering and mathematics. The increased number successfully graduates from home public high schools, colleges and universities would stimulate creation by entrepreneurs in private and public sectors the home high tech industries and services with increased number of potential employment in these high tech industries and services.

As the result it would be increased the percentage of the working population with increased incomes that creates the additional market incentive for increased supply the high tech products and services as well as increased tax revenue without increased level of tax's rates. Such increased tax revenue in the long run would not only eliminate the problem of the financial solvency of the existing Social Security system in the long run, in foreseeable future, but would open the additional financial resources for reasonable improvements of the benefits for future Social Security system participants.

III. The Idea is solidly sound and reasonable because it is completely affordable morally, economically, socially and politically.

That point is so important and decisive that requires more deep elaboration on each presumption.

First, what is about moral affordability, about just nature of the Idea? As the Declaration of Independence said – “*We hold these Truths to be self-evident, that all Men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty, and the Pursuit of Happiness.*“ None discriminatory Endowment of each born child in the USA independent on his/her race, ethnicity, heritage, family composition **equally** with \$10,000 gift, the 15 years bond by the Federal Government from Treasury is the precisely practical realization and support of the cited above statement of the Declaration of Independence.

Second, what is about economical affordability for the Idea, about right time of its implementation? To make a reasonable answer on such question let's give necessary numbers, quantitative justifications.

The population of the USA is close to 300 millions. Birth rate is 14.13 /1000 population. Life mortality rate is 6.63/1000 live births. With those numbers it is quite reasonably to suggest that the annual birth rate children to whom at their 3 years birthday the Idea proclaims endowment of the \$10,000 15 years bond certificate-gift from Treasury is around 3 million annually (around 1% annual birth rate) if to count a natural lost of live burn children by fatally illnesses and accidents, the facts that some portion of children from families would migrate from the USA and that there is some portion of families that can afford and would prefer private or family schooling for their children.

Now, let's cite budget numbers. The GDP is \$10.99 trillion. The revenue of the annual budget is \$1.782 trillion, the budget expenditures is \$2.156 trillion (budget deficit is \$374 millions).

So, the Idea requests annually approximately 30 billions expenditures from Treasury. It takes only 0.27% of the annual GDP, 1.68% of the budget revenue and 1.39% of the budget expenditures. For comparison - the total annual military expenditures are \$370.7 billion, annual additional expenditures to support the military activities in the war in Iraq are approximately \$50 billion annually.

The investment of \$30 billions annually from the Treasury in new burn children-citizens of the USA is the most indisputably justifiable and profitable public investment in the long run even from the economical and monetary policies points of view.

Third, what is about justification and affordability for the Idea from the social and political points of view?

From the social point of view the Idea is not only affordable and permissible but rather is highly desirable and welcomed. Really, none discriminatory nature of the Idea and its progressiveness (the \$10,000 bond from Treasury for any new burn child independent to the taxes paid to Treasury by parents) provide and support equal start opportunity to use approximately \$25,000 accumulated by bond for 15 years for professional education and life to any child successfully graduated from home public high school and entering into their own adult life.

From the political point of view the Idea is exclusively nonpartisan measure that might and has to be debated in the Nation, media and the Congress, legislated by the Congress and signed by the President in the law of land.

Sincerely and respectfully, I'm



Digital Imaging General

DIMAGE, Inc.

...dimage vs. damage...

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P.S. That text has been written in year 2005. So, there is needed to add some comments reflecting current situation and new political, economical and social environments.

So, the One Idea - as the first criteria is concern - targets indeed the most critical situation for the prosperity, national, economical, social securities of the USA and its population, its citizens for foreseeable future.

There is no doubt that the current system of the public schools and education in the USA is, unfortunately, in the big troubles, it is **broken**. It is the most serious and influential crisis for the USA and its population, crisis that is so vividly and widely influential not only for today life but, what is no less important, for foreseeable future. The USA is on one of the last place in the list of 24 developed countries by the level of skills of the public high school graduates in science and math. The very essential percentage of the public high school students dropped the high school before graduation.

As the result the USA colleges and universities cannot fill up their undergraduate and graduate schools in science, technology, engineering and mathematics by the graduates from the domestic public high schools of the USA what forces the USA colleges and universities to compensate such shortage by attraction foreign high school graduates to fill the gap.

The low average level of home high school graduates especially in math and science, the high percentage of students that are not graduated from Nation's high schools at all are the main reasons of severe shortages to fill job positions in high tech industries and in such crucial public services as modernized educational, medical and military (national security) services for example. Attraction a high number of highly educated foreigners-immigrants and migrants to compensate such shortages - that is only the contradictory **illusion** of solution especially in the long run perspective - eliminates market oriented, supply and demand incentive to improve home, domestic public schools and education level, improvement and progress in our economical and social well being.

Such shortages are direct threats to the national and economical securities of the USA in the XXI century with its dominant role of the high tech industries and services in economical, social, political and security life.

Of course the measure One Idea alone is not able to heal, improve public school and education system in the USA. There are some additional measures that needed like improving professional skills of teachers, for example, and some others no less important. But the measure One Idea is **absolutely necessary** measure. It is no hope without its implementation because the One Idea established and stimulated first time the extremely crucial role of parents in the successful education of their kids.

It is the most important and needed **change** in national culture, it is the most important role of adult population, parents and other adult family members – to take their part of **public** responsibility for the success of high education their kids who would define our prosper future. In the same time the measure One Idea is the most needed and profitable investment of taxpayers' money.



**Comments before PCAST on STEM Education
October 23, 2009**

**Howard Gobstein
Co-Director, Science and Mathematics Teacher Imperative
Executive Officer and Vice President,
Association of Public and Land Grant Universities**

Thank you, Members of PCAST for your anticipated efforts on the critical issues of STEM education.

As Nancy Zimpher, SUNY Chancellor passionately observed several years ago, when APLU was considering a potential STEM effort: “Despite all the studies, all the projects, all the initiatives, we have hardly moved the dial” (in STEM education and teacher preparation).

We are at an incredible moment --

Never in my decades of watching Washington research and education policy have I seen such an alignment of expertise, inspirational leadership and resources facing the increasing national challenge of the nation’s STEM workforce and overall literacy.

I have two requests for PCAST to take advantage of this extraordinary opportunity:

1. **Please promote the critical underlying importance of reforming undergraduate science education** by Carl Wieman – and others like him, such as Jo Handelsman, with her Scientific Teaching workshops at Wisconsin; Ann Austin, MSU, co-PI of the network for The Center for the Integration of Research, Teaching, and Learning (CIRTL) across 6 universities. Without these and similar efforts, we will continue to lose sorely needed well qualified students from STEM fields, denying their potential STEM contributions to industry, government and academia – and especially -- teaching. The Business Higher Education Forum’s Dynamic Systems Model of U.S. STEM workforce and education has indicated that

increasing retention of undergraduate science and education students is one of the most significant levers to affect the future STEM workforce.

- 2. Determine how to use the clout and funding of Federal science agencies to enhance the stature of faculty who wish to make their research contributions by better understanding how to convey STEM knowledge through more effective teaching and teacher preparation. Those federal agencies, particularly those related to national security rely heavily on home-grown STEM talent, and we are dangerously neglecting their future needs.** The federal STEM education efforts featured yesterday are a pittance compared to the research funding by those agencies. And the amount of those programs devoted to education research in the STEM disciplines is a smaller percentage still. University faculty prestige and rewards are gained mainly by the research funding they win. Even a small increment in funding, would enable more faculty engaged in the Physics Teacher Education Coalition (PTEC/PhysTEC or the planned American Chemical Society parallel effort) to undertake quality research, perhaps even gaining tenure, as recently awarded to the two fireballs at CU Boulder, Valerie Otero and Noah Finkelstein, both physicists.

The time is ripe for necessary transformative change. Chancellor Richard Herman, Illinois Urbana Champaign, chair of our Science and Mathematics Teacher Imperative, intoned in launching the effort last November, 'for too long institutions like mine have stood aside' and its time for us to renew our responsibility'. Indeed, as the largest cohort of well-prepared science, math and engineering undergraduate students, and a heritage of research and public service, public research universities have a special role. The 219 members of APLU include virtually all the nation's public research universities in every state and conduct about 60% of the nation's academic research.

Thus far, 117 APLU presidents have committed to our Science and Mathematics Teacher Imperative to prepare more high quality and diverse teachers. They already prepare over 7000 math and science teachers annually, and a number of institutions are setting objectives to double and even triple the number of science and math teachers they prepare.

To enhance the quality of the teachers we prepare, with NSF funding, we are developing an in depth "Analytic Framework" to enable institutions to benchmark the specific attributes of their preparation programs against such leading member programs as UTeach and the Colorado Learning Assistants program. As part of an NSF MSP/RETA, 26 leading institutions are determining how to change their institutions to enhance the priority of science and math teacher education.

We thank you for your efforts and look forward to working with you however we might be of assistance.

October 23, 2009

The Honorable John Holdren
Co-Chair, President's Council of Advisors on Science and Technology
Director, Office of Science and Technology Policy
White House
1600 Pennsylvania Avenue, NW
Washington, DC 20500

The Honorable Eric Lander
Co-Chair, President's Council of Advisors on Science and Technology
President and Director, Broad Institute
7 Cambridge Center
Cambridge, MA 02142

Harold Varmus
Co-Chair, President's Council of Advisors on Science and Technology
President, Memorial Sloan-Kettering Cancer Center
1275 York Avenue
New York, NY 10065

Dear Drs. Holdren, Lander, and Varmus:

On behalf of the National Science Teachers Association, the largest organization in the world promoting excellence and innovation in science teaching and learning for all, thank you for your commitment to STEM education. As the leader in science education, NSTA reaches over 300,000 teachers every week, and we work to engage teachers of science nationwide and improve student learning by providing a vast array of products, services, and programs. Our current membership includes science teachers, science supervisors, administrators, scientists, business and industry representatives, and others involved in science education.

NSTA enthusiastically embraces the concept of STEM education, and we value the importance of engineering and technology in the K-12 curriculum. We welcome this opportunity to provide input to PCAST. We will be limiting our recommendations primarily to science education.

As you know, there have been some promising indicators for science and math education in the United States recently:

- ✓ In 2006, slightly more than half the states required 3 or more years of both mathematics and science courses for high school graduation. (*Science and Engineering Indicators 2008*)
- ✓ More students are taking advanced science classes; student course completion rates have increased since 1990 in advanced biology, chemistry, and physics, although they

leveled off between 2000 and 2005. (*Science and Engineering Indicators 2008*)

Growth was especially strong in mathematics. The Class of 2005 graduates completed mathematics courses at far higher rates than their 1990 counterparts in all categories except trigonometry/algebra III. The proportion of students completing courses in precalculus/analysis, calculus, and Advanced Placement/International Baccalaureate (AP/IB) calculus at least doubled since 1990. (*Science and Engineering Indicators 2008*)

- ✓ The National Math and Science Initiative posted a 71.5 percent increase in AP exams passed in math and science by African American students as compared to 13 percent nationally.
- ✓ More teachers are teaching “in-field.” Nationally, 61 percent of secondary mathematics teachers in U.S. public schools majored in their field, and 77 percent of science teachers majored in their field (*CCSSO State Science and Mathematics Education Indicators 2007*)

Unfortunately while many of these indicators are encouraging signs, we still have a long way to go. Overall student achievement in science is sadly lacking. In 2005 only 29 percent of fourth grade students, 29 percent of eighth grade students, and only 18 percent of 12th grade students scored proficient on the NAEP science exam. These scores have been virtually unchanged since 1996.

Years of research from the 2007 *Trends in International Mathematics and Science Study* (TIMSS) tell us that U.S. students do not perform well in mathematics and science as compared to students in many economically developed countries. Science scores for both fourth and eighth grade students have remained flat since 1995 and scores for minority students are dismal.

It is our belief that building the human capacity to educate students to be internationally competitive will require the nation to first address four major challenges to improve science education. Many of these recommendations are not new and have been presented in various reports over the past few years.

Challenge Number One: Lack of Coordination between K-12, Higher Education (Including Community Colleges) and Career and Technical Education (CTE)

Currently students do not know what is expected of them as they move from middle school to high school, and then from high school on to post secondary education. There are internal barriers at these major transition points for students, such as weak career counseling and job awareness connected to course and performance expectations, low course expectations for students, poor articulation across grade transition points (e.g. grade 8 to 9, grade 12 to 13) and institutional barriers such as courses for some students and not others, preventing those students from advancing to the courses they need.

In the October 30 2007 *National Action Plan for Addressing the Critical Needs of the U.S. Science, Technology, Engineering and Mathematics Education System*, the National Science Board (NSB) points out: “*The nation faces two central challenges to constructing a strong coordinated STEM education system: Ensuring coherence in STEM learning and ensuring an adequate supply of well prepared and highly effective STEM teachers.*”

The National Science Teachers Association agrees with the NSB recommendation that we must promote vertical alignment of STEM education across the grade levels from PreK through the first years of higher education by:

- Improving the linkages between high school and higher education and the workforce
- Creating or strengthening STEM education focused P-16 or P-20 councils in each state
- Encouraging alignment of STEM content throughout the P-12 education system

Recommendation: PCAST should support the development and implementation of policies that will encourage a vertical alignment of STEM education.

Challenge Number Two: Disconnected Infrastructure in Science Education (Standards and Assessments and Professional Development) Resulting in Uneven Delivery of Science

Standards and Assessments: The policies and instruments that are used for determining students’ performance and success in science are irregular and uneven within states and across this country. A coherent science education system can provide all students with the knowledge and skills necessary for life in the 21st century. The recent Wallace Foundation report (2009) titled *Research Findings to Support Effective Educational Policymaking* states: “*Close collaboration between states and districts has not been the historic norm. It is complex, time consuming and challenging to maintain. And it takes the sustained backing of top government and education leaders with the authority to make changes happen.*”

The National Science Teachers Association agrees with the 2009 Carnegie Corporation report titled *The Opportunity Equation, Transforming Mathematics and Science Education for Citizenship and the Global Economy* and calls on the nation to “*Establish common science standards that are fewer, clearer, and higher and that stimulate and guide instructional improvement and galvanize the nation to pursue meaningful math and science learning for all Americans.*”

These common national K–12 science education standards should be drawn from current national standards documents, and be more streamlined and focused, and organized around a small number of big ideas rooted in the major fields of science that develop over the K–12 span and include crosscutting concepts and skills that would unite the disciplines in a deep, meaningful way.

National assessments and accountability mechanisms should be developed aligned to common science standards. This will enable schools to better guide instructional improvement and

innovation in science. Students can move from school to school, and state to state and find similar expectations and accountability measures.

Teacher Professional Development: Long term, coherent, reform-based professional development is essential for all teachers of science. Research shows after 80 to 100 hours of professional development, teachers reported more inquiry based practices. Professional development should focus on content knowledge, active learning, and be coherent with other activities. Significant in improving these are collaborative learning opportunities, groups of teachers from the same school, and the duration of the professional development program.

The NSTA strongly agrees with the National Research Council 2006 report *Taking Science to School: Learning and Teaching Science in Grades K-8* that “state and local school systems should ensure that all K-8 teachers experience sustained science-specific professional development in preparation and while in service. Professional development should be rooted in the science that teachers teach and should include opportunities to learn about science, about current research on how children learn science, and about how to teach science.”

Recommendation: PCAST can assist the science and education communities efforts to develop common standards that are more focused, aligned, and coordinated with assessments and advocate for quality, evidence based teacher professional development experiences.

Challenge Number Three: Lack of Funding For Equipment and Supplies

It is unfair to have high expectations for students if teachers and schools do not have the requisite materials and equipment to properly teach science. A 1995 U.S General Accounting Office (GAO) report found that 42 percent of schools surveyed reported they were not well equipped in the area of laboratory science. A second 2000 GAO report found that approximately 40 percent of college students who left the sciences reported problems related to high school science preparation. This under preparation was linked to problems such as a poor preparation in math and lack of laboratory experiences or exposure to computers.

Abstract learning does not provide students with the understanding of science needed for problem solving and innovative thinking, but rather memorization of information. Developmentally appropriate laboratory experiences are essential for both middle level and high school aged students, yet these experiences for a large number of students are abysmal. Far too many schools have undertrained or inadequately supported teachers, outdated lab equipment and insufficient materials-or in many cases no labs at all.

Although no specific research is available on science educators specifically, according to the QED 2006-2007 *Teacher Buying Behavior Report*, on average teachers report spending a total of \$475 of their own money on classroom materials and supplies. 44% of respondents spend over \$500 on their classrooms, with 20% spending over \$1,000, and 38% of teachers report needing materials that support differentiated instruction.

Recommendation: PCAST can encourage comprehensive federal policy that will ensure that STEM classrooms are adequately supported.

Challenge Number Four: Equity Issues in Science Education

Underrepresented minorities represent 34% of those aged 18-24 in the United States. We will need to find effective ways to reach these young people if we want a high quality STEM workforce in future years. While we all recognize this issue and it has been widely documented, only a few targeted yet disconnected programs are having success so the problem of disaffected minority students persists.

According to The American Council on Education report *Increasing the Success of Minority Students in Science and Technology* “The nation’s changing demographics and continued need to remain globally competitive make it clear that colleges and universities must increase the number of Hispanics and African Americans earning degrees in science, technology, engineering, and math (the STEM fields). Thirty-nine percent of people under age 18 in the United States are persons of color and this percentage will continue to increase (U.S. Census Bureau, 2000), placing young people of color at the vanguard of the next generation. It is upon this generation that the nation places its hopes for continued economic competitiveness in the Information Age.”

In 2000–01, only about 13 percent of bachelor degrees awarded to African Americans and Hispanics were in the STEM fields, compared with 31 percent for Asian Americans and 16 percent for whites. These figures have changed little over the past decade. (American Council on Education *Increasing the Success of Minority Students in Science and Technology*)

A closer look at the data reveals that African Americans and Hispanics enter higher education with the same level of interest in the STEM fields as their peers, but that they fail to persist in these majors at the same rate as their white and Asian-American classmates. (American Council on Education *Increasing the Success of Minority Students in Science and Technology*)

The NAEP Science 2005 Trial Urban District Assessment (TUDA) tells us that many of these challenges begin at the K-12 level:

- The 4th Grade Average NAEP Science Scores for the nation are 149. In the NAEP TUDA study of ten urban areas (Austin, Charlotte, Houston, San Diego, New York City, Atlanta, Boston, Cleveland, Chicago and Los Angeles), only one city (Austin) scored 147; the other nine urban city scores are significantly below the national average
- There is a wide disparity between the national percentile ranking of white students and black and Hispanic students in the same urban area. For example, Atlanta white students ranked at the 86th percentile, while Atlanta black students ranked at the 22 percentile.

- The 8th Grade average NAEP science score for the nation is 147. The 8th graders scores in each urban area assessed were significantly below the national average.
- In nine out of ten urban areas, more than half of the students scored at the below basic level in science.

Recommendation: PCAST should recommend the development of policies that would focus on underserved populations and ensure resources are targeted as needed.

To summarize we believe there are four key challenges and opportunities in science education:

1. Lack of coordination in grades pK-16 curriculum and instruction, which results in many unqualified students going on to higher levels of learning;
- 2 Disconnected Infrastructure in science education (standards, assessments and professional development);
3. Lack of funding for equipment and supplies, causing students to be disadvantaged in their learning;
4. Equity of opportunity to learn science.

Together these challenges contribute to a system of science education that precludes students from future success in STEM fields and poses a serious threat to our nation's competitiveness. Targeting the first two can contribute greatly to the overall systematic improvements that are required. These challenges can be addressed with a thoughtful approach from policymakers that include key leverage points for improving the science educational system.

Thank you for your support of science education. If you have any additional questions please contact me at feberle@nsta.org or at 703-312-9255.

Sincerely,



Francis Eberle
Executive Director
National Science Teachers Association

President's Council of Advisers on Science and Technology (PCAST)

October 23, 2009

Remarks by

Gerhard (“Gerry”) G. Meisels, Ph. D.

Professor of Chemistry and Director

Coalition for Science Literacy at the University of South Florida, Tampa, FL

Vice President, National Alliance of State Science and Mathematics Coalitions (NASSMC)

Past Chairman, Council of Scientific Society Presidents (CSSP)

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In a 1993 CSSP meeting on science education, I became aware of the poor condition of Mathematics and Science education in the US. I gave up research and administration, and created and assumed leadership of the Coalition for Science Literacy at the University of South Florida in Tampa. I am presenting three action recommendations for your consideration:

1. It will take a solid, attention-getting investment to capture our nation's attention, lead it to value science and science education more highly, and produce a large-scale measureable outcome. Money talks. **My first recommendation is that you request a sizable appropriation to address improvement of STEM education on a large scale.**
2. Continuing research is important, but every design needs to be frozen at some point and turned over to construction. Taking action is urgent and there is a substantial understanding of what needs to be done as mentioned yesterday.¹ **My second recommendation is to emphasize not innovation but large-scale competent implementation.**
3. You have been presented with a number of fine and worthy model programs. The state of our science education is a disaster that calls for triage strategies that give highest priority to treating the worst bleeding. As President Katehi noted yesterday, we lose the kids in elementary school, to be precise, we lose 2/3 between 1st and 6th grade.² The remaining 33% do not meet our nation's need for 80%!³ We lose them because elementary school teachers are not driven by a love for science but by a love for kids.⁴ A large majority of elementary teachers are afraid of science, don't want to teach it, and transmit their negative attitude to their students. **My third recommendation is that you establish a presidential expert panel on elementary science education to choose options, identify policies needed, estimate cost, and draft legislation.** Examples of approaches that could be investigated range from Alabama's kit-based AMSTI program⁵ to broader use of science specialists in elementary schools.⁶

¹ Donovan, M. S., and J. D. Bransford, Editors (2005), *How Students Learn*, National Academy Press, Washington, DC; Donovan, M. S., and J. D. Bransford, Editors (2005), *How Students Learn – Science in the Classroom*, National Academy Press, Washington, DC; Duschl, R.A., H. A. Schweingruber, and A. W. Shouse, Editors, (2007), *Taking Science to School*, National Academy Press, Washington, DC; Michaels, S., A. W. Shouse and H. A. Schweingruber (2007), *Ready, Set, Science!*, National Academy Press, Washington, DC

² Eckelmeyer, K. H. (1995). Presented at the NSRC Working Conference for Scientists and Engineers, Huntsville, AL. This older reference is used to illustrate that this problem has been known for a long time.

³ Calculated from *Science and Engineering Indicators* (2002) Text Tables 3-1, 3-2, pages 3-6, 3-7. Note: “Use S&E skills” includes all those in SESTAT-defined “S&E” jobs and those in SESTAT-defined “Non-S&E” jobs who “closely” or “somewhat” use S&E skills in those jobs. J. A. Vasquez, Presented at the Florida Summit on Science Education, February 2005

⁴ Raizen, Senta A. and A. N. Michelsohn, Eds, 1994, *The Future of Science in Elementary Schools*, Jossey-Bass Publishers, San Francisco, CA. This older reference is used to illustrate that this problem has been known for a long time.

⁵ Alabama Mathematics, Science and Technology Initiative, <http://www.amsti.org/>; last accessed October 21, 2009

⁶ Swartz, R. S. and J. Gess-Newsome (2008), *Elementary Science Specialists: A Pilot Study of Current Models And a Call for Participation in The Research*, Science Educator 17 No 2, 19-30,

PCAST October 22-23, 2009 Meeting: Public Comment Session Speakers

Francis Eberle

Executive Director
National Science Teachers Association

Philip Hammer

Associate Executive Officer
American Association of Physics Teachers

Howard Gobstein

Executive Officer and Vice President
Research, Innovation and STEM Education
Co-Director, *Science and Mathematics Teacher Imperative*
A.P.L.U. -- Association of Public and Land-grant Universities

Ed Potosnak

Legislative Assistant
Office of Congressman Mike Honda

Karl M. Glasener

Director of Science Policy
American Society of Agronomy
Crop Science Society of America
Soil Science Society of America

Jim Brazell [Read on his behalf.]

Consultant
Innovation Creativity and Capital Institute (IC2)
University of Texas and the Schriever Institute
San Antonio, Texas

Caron Gala

Agriculture and Food Research Initiative Coalition

Robert Gropp

Director of Public Policy
American Institute of Biological Sciences

Najmedin Meshkati

Professor
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Engineering
University of Southern California

Gerry Meisels

Professor of Chemistry and Director
Coalition for Science Literacy
University of South Florida, Tampa, FL

Dmitry Novik

DIMAGE Inc.

Mark Christensen [Read on his behalf]

Patti Curtis

Managing Director, Washington Office
Museum of Science, Boston
National Center for Technological Literacy

President Barack Obama and
President's Council of Advisors on Science and Technology
Office of Science and Technology Policy
Executive Office of the President
725 17th Street Room 5228
Washington, DC 20502

October 20, 2009

RE: PCAST STEM Meeting 10.22-23, 2009, Two Minute Public Comment Letter

Dear Mr. President and distinguished members of the President's Council of Advisors on Science and Technology,

On October 16, 2009, Jim Brazell was in the Denver airport where he purchased the latest Business Week. The title read "The Lost Generation: The job crisis is hitting young people especially hard--imperiling their future and the economy—by Peter Coy." As he put the magazine on the counter to pay for it, the young male cashier said, "That's the truth." After a brief conversation with him, Jim mentioned career and technical education and the cashier responded, "I wish I had done that." To which Jim replied, "It's not too late, community and technical colleges and universities both have programs aligned to good jobs in tough times—and the future."

According to the Bureau of Labor Statistics, the unemployment rate for 16-24 year olds is the highest among US age groups. Unemployment among this cohort has steadily increased from 2007 to the present. Thus, the United States is in need of strategies to increase US economic cooperation, competitiveness and innovation in the fields of science, technology, engineering and mathematics. We are also in need of STEM-based strategies to transform the whole of the P-20 education system and outcomes for the youth and young adults who will create the future.

Today, a well rounded high school student is ready for life, career and the rigor of the P-20 system of education. The irony of our time in history is that TECH PREP and Career Pathways, modern vocational education, provide this well rounded student and simultaneously increases K-12 performance, retention, recruiting, graduation, and matriculation to deliver a P-20 educational pipeline. TECH PREP is the modern equivalent of academic preparation (AP) plus it has the added bonuses of expanding equity for diverse student populations and closing the gaps among K-12, community and technical college, **and university pathways.**

Similar to President Obama, after the launch of Sputnik, President Eisenhower, in the late 1950's, faced rising global tensions, a critical time window and very low tolerance for failure. Eisenhower discovered the M.I.T. Physical Sciences Study Committee (PSSC) who had created and proven new curricula for science and physics on a small scale. The PSSC curricula allowed the U.S. to disseminate and scale up education reform—answering the call for innovation while managing risk for failure through cooperation of the nation's K-12, community and technical college and university system.

We submit to you today that TECH PREP in its founding origin--full college-bound academic load, plus Career and Technical Education courses, plus college courses—is the P-12 modern equivalent of PSSC and a demonstrated solution to your STEM goals and to global educational transformation. TECH PREP is supported by, but differentiated from, the modern career pathways movement and the traditions of career and technical education (CTE) as the AP equivalent. TECH

PREP students attend school, graduate, and matriculate to college and university across the nation at higher rates than general academic or general CTE students—and they pass the standardized tests!

In April, when President Obama appointed PSSC members he said, “At root, science forces us to reckon with the truth as best as we can ascertain it.” We know as academicians the idea of work-based training strikes you as less rigorous than academic preparation; however, **we submit that emerging science says TECH PREP works and connecting hands and heads—mind and body—is the way ahead to the Next Great American Century.**

With hope for the future,

Jim Brazell, Consultant, Innovation Creativity and Capital Institute (IC2), University of Texas and the Schriever Institute, San Antonio, Texas

Dr. Deborah Stine,

I would like to inform President Obama and all those of PCAST about the current Herpes Simplex Virus research, HSV-1 (Cold Sores & Genital HSV-1) & HSV-2 (Genital Herpes which can become oral herpes).

According to a study conducted by The American Social Health Association and the Kaiser Family Foundation, there will be more than 15 million new cases of sexually transmitted disease every year. That boils down to 41,095 newly infected every single day. One of the most common sexually transmitted disease is herpes simplex virus (HSV) the cause of cold sores and genital herpes. 75% of the U.S. Population has HSV-1 while HSV-2 is affecting approximately 45 million Americans. It is estimated that 1 in 4 adults over the age of 12 have HSV-2. They're currently no cures or vaccines for HSV-1 and HSV-2.

This virus is sometimes a deadly virus to babies and I believe more funding is necessary to protect our youth, cure those infected and protect future generations. Researcher Dr. David M. Knipe at Harvard University is researching a HSV vaccine. Researcher Dr. Bryan R. Cullen at Duke University is researching a HSV cure. Researcher Dr. David C. Bloom at University of Florida is researching a way to inhibit HSV which would prevent recurrence.

Facts about HSV:

- **HSV-1** (Cold Sores & Genital HSV-1): Herpes labialis is an infection caused by the herpes simplex virus 1. It leads to the development of small and usually painful blisters on the skin of the lips, mouth, gums, or lip area.
- Most people in the United States are infected with the type 1 virus by the age of 20. 75% of the U.S. population has HSV-1.
- The virus remains in the nerve tissue of the face.
- The virus can be transmitted through fluids from the mouth (asymptomatic viral shedding) even when the carrier is not having an outbreak. This is the #1 cause of HSV transmission.
- The virus can infect the genital area causing genital hsv-1 through oral sex.
- Herpes infection of the eye is a leading cause of blindness in the United States, causing scarring of the cornea. An estimated 400,000 Americans have recurrent ocular herpes, with 50,000 new cases occurring each year.

- **HSV-2** (Genital Herpes & Oral Herpes): Genital herpes is a sexually transmitted viral infection affecting the skin of the genitals.
- In America, one out of every four of the adolescent and adult population are infected with genital herpes.
- It is possible for a person to carry the virus without knowing that they have it, since up to 90% of people who are infected with genital herpes show no signs of the infection.
- Once a person is infected, the virus hides within nerve cells, making it difficult for the immune system to find and destroy it. Within the nerve cells, the virus can remain dormant for a long period of time, which is called "latency."

I hope with the information I've provided to PCAST, those affected by the HSV virus may be one step closer to having cure and vaccine research be funded. Besides the doctors I've listed, they're many other universities and private companies studying both cures and vaccines.

Your consideration to have my letter read is greatly appreciated.

Sincerely,

Mark Christensen

Science Specialists in Elementary Schools

Draft of a White Paper

By

Gerry G. Meisels and Anna R. Lewis

Coalition for Science Literacy

University of South Florida

Tampa, FL 33620

Realistic assessment of teacher capabilities, pragmatic considerations such as cost effectiveness, and effect on student perception of science support a shift to science teaching in the elementary grades by science specialists.

The deplorable state of science education in the U.S. is well known and documented. Two major problems have long been identified. First, high school graduates are not able to think critically using evidenced-based strategies. In addition, they do not understand basic scientific principles and concepts. As a result they lack transferable skills and competencies, which lead to difficulty in dealing with the demands of a constantly changing employment market. Second, the number of U.S. students pursuing college-level study in Science, Technology, Engineering and Mathematics (STEM) is insufficient to meet the needs of our technology-based innovation economy. This shortage of young people able to support and advance technology initiatives puts America's future at risk. In our fast-moving world action needs to be taken now.

Why Focus on Elementary Grades

It is well documented that the problem begins in our elementary schools.¹ Attitudes are shaped early and are then carried forward into the upper grades. Student perceptions of science change from positive in first and second grade to negative in grades three to six.^{2,3} This change in attitude can be attributed to elementary school teachers, who are frequently poorly prepared to teach science. Many elementary teachers have taken only two or three college-level science courses,⁴ find science topics difficult to teach, and therefore avoid teaching the subject if possible. When these educators do teach science, they often signal their dislike and even fear of the subject to their students.^{5,6} Student experience in elementary school is the bedrock on which education in the upper grades is built. Large scale change in the way science is taught in elementary schools is required to achieve long-term and continuing success.

Why Science Specialists in Elementary Schools: Practical Reasons

We must focus on student outcomes. There is ample evidence that hands-on science using appropriate materials such as those in STC,⁷ GEMS⁸ and FOSS⁹, kits improve student interest and learning in science.¹⁰ However, effective teaching requires that teachers have science content knowledge and self-confidence in science.^{11,12} Achieving such confidence in the two million elementary school teachers in the U.S.¹³ is not a realistic objective for several reasons. These include

- the annual cost of several billion dollars to provide adequate professional development for two million elementary school teachers; an order of magnitude fewer specialists can be prepared in greater depth at lower overall cost.
- the negative attitude toward science held by many elementary teachers,

- the large fraction of elementary school teachers unable to distinguish between belief and conclusions based on observed evidence¹⁴
- the inability to make up for inadequate preparation in college within a reasonable period of professional development
- the competing demands of teaching other fields such as reading and mathematics that are subject to high-stakes tests

A shift to using science specialists for teaching science in the elementary grades therefore recommends itself on very practical grounds. This the major argument for using science specialists. In addition, science specialists appear to be more effective in achieving improved student learning and attitudes towards science than the average elementary school teacher.¹⁵

Why Science Specialists in Elementary Schools: Outcomes Reasons

Of the two objectives of science education named above, an increase in the number of high school graduates that pursue STEM in college is too removed from the elementary grades to be measured. What can be measured are increased student learning and improved student attitudes.

There are a substantial number of qualitative and some quantitative studies that indicate greater effectiveness of science specialists.^{16,17,18,19} These include:

- Comparison of two science specialists with 23 other teachers in two school districts. It showed that students of specialist teachers performed significantly better in life sciences ($p < 0.01$) and physical science ($p < 0.001$)¹⁴
- Performance of 1381 fourth grade students on New York's Elementary Science Program Evaluation Test. Students taught by science specialists performed significantly better on science skills tests. These differences were especially noticeable for Hispanics, Blacks, and students from high poverty homes²⁰
- A survey of all teachers in 11 schools. All teachers in schools with science specialists rated their schools significantly higher in commitment to science intellectual values and methods of inquiry²¹

In 2008, an invitational conference examined different models for the use of elementary science specialists ranging from a resource function for other teachers to full science class responsibility.^{22,23,24} While this conference did not provide new evidence, it highlighted the increasing interest in abandoning the traditional one-teacher-teaches-all model of elementary education.

Conclusion

The currently predominant practice of teaching science in elementary schools by all teachers influences student perceptions of science negatively. Expecting to change practice of all such teachers is unrealistic and its cost would be forbidding. Developing a system of science specialists is an attractive option. More research, especially research using quasi-experimental methods, is certainly desirable²⁵. Given that the need for change is urgent, a federal program that would provide incentives and support the transition period from traditional to specialist science teaching would demonstrate with high visibility President Obama's commitment to long-term improvement in science education as a foundation of future economic growth.

August 28, 2009; revised October 26, 2009

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WHITE PAPER

Video Publication Service – New Interactive TV Public Services [TV (Video) Publishing House, TV Public Library, Personal TV (Video) Book]

Dr. Dmitry A. Novik ©

Introduction

It's well known how important the role of the different paper printed information (the paper publication products, service) in all kinds of human and society activities. These paper publication products are directly associated with the paper printing technology introduced still in XV century by Johann Gutenberg (1400-1486). The paper printing technology dominates publishing products market until the second half of this century when paper publication information starts to be disseminated also via telecommunication channels and networks by according electronic signals and digital files.

The FAX technology first converts paper publication products to according electronic signals and utilizes public telephone lines as a way for electronic global wide dissemination, distribution of the paper publication products. Unfortunately, this FAX technology is none interactive and expensive way of the on-line service for delivery of the none color, none perfect image quality paper publication products to remote clients, end-users. The next important steps were on-line interactive service from a remote data (image data particularly) base (like America Online, for example) or from a myriad of data bases connected via telecommunication network (like hypertext WEB pages on Internet) to the distant computer equipped end-users. In spite to the fact that these interactive computer assisted types of the electronic preparation, dissemination, distribution of the paper publishing products much more efficient than the FAX technology, they, unfortunately, also have some weaknesses. The most important among them – these interactive computer assisted technologies are still too expensive and do not support the high image quality of the paper printed technology.

The Video Publication Service (**VPS**) is a really new, not only publication, but also public TV service generated by a radically **new, completely interactive and absolutely friendly to customers, TV-watchers** TV technology and system carrying and delivering in a new electronic video, TV form **all** known sorts of publishing (printed) information (products).

Additionally to the interactivity of the **VPS** which is extremely convenient for the TV watchers making easier to them **to read** the **text** information and to **look** at the **still** images of the TV publishing product on the screen of TV monitor the **VPS** is the most cost effective electronic media of the mass dissemination, distribution of the publishing information, publishing products for the absolute majority of population if to count the world wide penetration of TV networks and practically unrestricted spread of TV sets among the globe population.

Even more than this – the **VPS** is able to generate a completely new publishing product which is impossible to generate by paper printing technology at all and too expensive to generate by on-line computer assisted service – it is the combination, consolidation, fusion of the text, still images, motion pictures, and sound information in the most efficient, convenient, interactive customer-friendly, and cost effective form for TV watchers.

Let's emphasize also that the **VPS** is completely **compatible** with all existing TV standards as well as with all potential future TV standards because it generates the VPS's TV signal in the form of the standard TV format.

Finally, let's remark also that the VPS generates a new, the most cost and functionally effective way not only to produce and **broadcast** effectively the TV advertising commercials, but really to use them by TV watchers-customers. This remarkable feature of the **VPS** potentially enables to change dramatically TV commercial broadcasting as we know it today breaking up, as a matter of fact, the necessity itself consolidate TV commercials with TV news, sport and entertainment programs in one fused TV programs. As it will be explained later on, such separation, in TV channels and time, '**divorce**' between commercials and TV news&sport&entertainment programs benefits both branches of TV services, TV watchers – the customers of these two potentially **separable** branches of TV services.

The general principles of the VPS technology and systems.

It will be much easier to explain and understand the general principles of the innovative VPS technology and systems if to start from the emphasizing of the inefficiency of the standard TV technology and systems for the transmission and reading the **text** information and visual analysis of the **still** images from the screen of TV set. Such inefficiency of the standard TV technology and systems is grounded in the main principle of TV supporting the transmission of the **motion pictures, temporal** changes in pictures. By the main principle TV is able to transmit every next TV frame as a **completely new** frame-picture having nothing to do with previous frame-picture – the same as for the motion picture films. The constant frame frequency (field frequency for interlaced TV scanning) 60 frame-pictures per second (50 Hz in Europe) permits to see on the TV screen unbroken and none flashed in time motion of the picture's objects. It means that one TV frame has only 1/60 sec. duration in time which is absolutely inappropriate, insufficient to read the text in TV frame or to analyze an image of this TV frame. So, in order to be **readable** the same text page needs to be visualized by TV screen by many neighboring TV frames – approximately no less than 7200 TV frames (7200/60 sec.=2 min.) because in average it takes someone around 2 minutes to read text page (the same period of time, approximately 2 minutes, well trained radiologist spends to 'read', interpret the X-Ray of a chest, for example).

It all means that the standard TV technology is very inefficient, redundant for the TV transmission of the text and/or still images information – the standard TV signal utilizes no more than 1/7200 part (!) of the channel capacity being allocated and spent for the transmission of the TV signal when it delivers the text or/sand still images information.

More than this, the approximate evaluation of the time needed to read text page or to visually analyze a still image mentioned above does not count that the really needed time to read and understand the text, to look and interpret an image is **variable** value and fluctuates dramatically because it depends on the essence and complexity of the text and/or image and the analytical skills of the reader-analyst personally. The principle of the direct (on-line) TV broadcasting does not allow adjusting the time of the delivery of the text and/or still image information transmitted and visualized by the standard TV signal with the needed personally different time to read, understand and interpret this information – the existing standard TV broadcasting by the principle is just **not interactive** at all.

Nothing new to use VCR in order to record on-line broadcasting TV signal and after, off-line to look, read according TV frames-pictures **frame- by- frame** with managed by the TV reader analyst the time of the visualization of the 'frozen' TV frame so long as it's needed for this TV reader-analyst to read and interpret any TV frame with text and image information in it.

It's exactly one of the interactive modes to use VCR – another one, the most general and common mode is to look the recorded TV program with some designed delay after the direct on-line TV broadcasting and without any frame-time scaling-transformation.

But, unfortunately, only the transition to the interactive off-line frame by frame watching of TV signals previously on-line recorded on VCR is not enough to make the TV transmission of the text and/or still images information by according TV signals efficient enough. The only way to make it is to innovate the way of the generation of the **VPS's** TV signal carrying the text and/or still images information in it.

Let's synthesize, therefore, the **special VPS's** TV signal carrying the publishing product (text pages and/or still images) information in the format of the TV standard (NTSC, PAL, SECAM) signal in which each text page needs to be read from the TV screen is represented by only **one** according TV frame, each still image needs to be visually analyzed from the TV screen is represented by only **one** according TV frame. It means, in other words, that there is not any two different TV frames carrying the same text or still image. Therefore, the sequence of the text pages according to the paper printed book (the paper printed publishing product), the sequence of the text pages will be represented in such special **VPS's** TV by the according sequence of the standard TV frames-pages – every one frame for only one text (or/and still image) page. It's possible, as it was mentioned before, to incorporate to such **VPS-s** TV signal carrying publishing (text and/or still image) information the standard TV signals (video-clips) carrying motion pictures accompanied with according sound. Such fusion of the standard video TV signal (TV clips) and publishing TV signal assembles the **VPS's** TV signal ready to be transmitted as the standard video TV signal via standard TV broadcasting, cable, satellite telecommunication channels and networks.

The synthesizer of such **VPS's** TV signal by according hard and soft ware may be considered as a virtual **VPS's** TV camera.

So, such specially synthesized by a virtual **VPS's** TV camera the **VPS's** TV signal carrying publishing information is transmitted via standard air (broadcasting), cable, satellite telecommunication channels and networks ; then recorded by customer's VCR or other available TV signals recording memory device, and finally visualized on the screen of TV set by the **interactive**, completely controlled by TV reader-analyst regime of the **frame by frame**, page by page reading this publishing information from VCR.

Let's now underline such main features of this new VPS technology and systems which demarcate them from **all known** TV systems and technologies. The virtual **VPS's** TV camera transforms the publishing information into the special publishing **VPS's** TV signal in the **standard** TV form (like NTSC, PAL, SECAM standard formats) for which **every next TV frame is a new one** having **no imaging correlation** at all with any previous TV frame(s). It means that such publishing **VPS's** TV signal has not any temporal, interframe redundancy at all. As it's well known, for all other TV signals which are generated by the standard TV cameras and designated for their direct watching on TV set their temporal redundancy is very high as far as for the majority of TV frames the correlation between neighboring, consecutive TV frames is very strong with small amount of changes between these frames; correlation is eliminated only for such TV frames which are associated with the radical changes in scene.

The absence of any temporal redundancy in a new special publishing **VPS's** TV signals, in other words, the highest possible level of a **complete elimination** of the **interframe redundancy** for these **VPS's** TV signals means some virtual interframe video data compression and, therefore, determines the highest level of the efficiency of the transmission the publishing information by these **VPS's** TV signals via standard TV telecommunication channels and networks, and the highest efficiency of the recording of such **VPS's** TV signals on VCR. Such

efficiency may be estimated by the speed of the transmission of the publishing information, by the price for delivery every piece (in our case it is the text page) of that information, by the number of the pages of the recorded publishing information available for one Video Cassette (VC).

Let's give the quantitative figures for all these three parameters. The different formats for TV frame and paper printed page is the reason why one paper printed page will be represented by **two** TV frames. It means that the speed of the transmission the publishing information is $v_{vp} = 15$ pages/second, or **900** pages/minute, or **54,000** pages/hour!

As it is well known, the VC in the SP mode providing the highest resolution of the recorded TV signals is capable to record two hours of TV time. It means that one VC has on its tape

$$N_{vp} = 108,000 \text{ pages!}$$

The price of the delivery for one VPS's TV page may be calculated on the base of the price for the delivery of the one TV frame. For the case of the cable channel subscriber the price for one TV frame will be

$$c_{vp} = 4.5 \cdot 10^{-4} \text{ cents/TV frame or } 0.0009 \text{ cents /TV frame!}$$

Such price even more than **10 times cheaper** than the price of the one sheet of **clean** paper **without any printed information (text) on it!**

Let's mark and remind that these figures for v_{vp} , N_{vp} , c_{vp} are received in assumption that the VPS technology is based exclusively on the existing **analog** TV technology not using **digital** image data compression methods and techniques for the reduction of the essential **intraframe spacial** redundancy which is very characterized for a still image of the publishing products like text page. In the case of using the digital image data compression technology, for example like the **JPEG** Standard, the data compression ratio for the images of the video publication may be evaluated in the range no less than **20:1**. It means that by the transition to digital TV technology and image data compression technique, particularly, these figures will be additional at least **20** times more profitable for the VPS. Such using of the image data digital compression technique for the reduction of the intraframe positional redundancy of the publication VPS's TV signal means in a reality much more than only quantitative gain (benefit), it will give some very important qualitative change of the VPS technology like more simple and cheaper VCR and the possibility to spread widely the VPS using it for more and more kinds of publication products.

The second feature of the 'publishing TV frame (text and/or still image in it) is that it does not accompanied by any **sound** information. It means that that the sound channel of the TV Transmission line may be used in the case of the VPS as the channel for the bidirectional communication between cable channel subscriber and cable channel operator for the transmission the **demands** from subscriber(s) and control signals from cable channel operator (computer) to manage the regime of the recording by subscriber's VCR. An empty sound channel for the VPS's TV may be used also for some digital signals for TV publishing frames controlling their recording and reading by VCR.

The next feature of the publishing TV signals is that they can not be watched on the screen of TV set **directly** because every next TV frame is a **new one** and visual-mental capability of the human observer-watcher to read, to understand, and recognize the essence of the text information on the TV screen is much-much more that duration of the one VPS's TV frame (**1/30** sec.). Really, we need no less than about **2** minutes (**120** seconds) only for simple reading of one text page. Therefore, the virtual video data compression ratio providing by VPS's TV technology may be evaluated as no less than

$$120 \times 15 = 1,800 \text{ times!}$$

Let's underline once more time that the **VPS** is capable to provide all sorts of information which is available by the standard existing paper publishing technology which reproduces on the paper page the combination of the text and still pictures. These publications are: periodical and none periodical publishing, news papers, news letters, magazines and journals, catalogs, directories, patents and Trade Marks, official records, books, text books, manuals and Training Courses - to name a few. More than this, a new **VPS** have the possibility to deliver radically new publishing products - the **consolidation of the text, still and motion pictures accompanied by sound as well**.

Let's emphasize now the difference between interactive off-line **VPS** and other interactive computer assisted electronic on-line services for dissemination and delivery of the publishing (paper printed) information. First of all, computer assisted on-line service allocates the channel capacity of the telecommunication channel exclusively for only one end-user, when the **VPS** under its TV broadcasting principle have not any restriction on the number of end-users using allocated channel capacity of the TV broadcasting. Number two, computer assisted on-line service visualizes the publishing products with the restricted number of fonts for alphanumerical representation of the text.

The conclusion and final remarks

Let's start from the remark that the **VPS** supports two categories of the publishing products. The first one is some electronic video analogue (duplication) of the existing paper publishing products. The second group is rather principally new publishing products for which we cannot find analogue among previously published paper printed publishing products.

Let's remind, particularly, that the libraries and archives have accumulated all sorts of paper printed publishing products before introduction a new **VPS** and, therefore, there is the necessity to generate from paper printed publishing products their video (**VPS**,s TV) duplicates. At the same time for all new publishing products video duplicates may be and needs to be generated directly as the transformation of the electronic digital publication files to the corresponding publishing **VPS**,s TV signals.

Let's emphasize one more time that the **VPS** closes the very essential and wide gap which exists right now in dissemination and delivering via telecommunication channels and networks the publishing information and products to such majority of global population which have not personal computers and access to on-line services and/or Internet at all.

Let's mention also that beyond a direct influence on the publishing products' market the **VPS** will have some indirect but very important social, sociological and psychological impact on the TV equipment market. It's no doubts that the **VPS** will boost many TV products which already on the market widely. Really, until TV systems were targeted only for the TV direct watching, TV sets, VCR were some **family** goods for not only personal but collective watching as well. Reading from the paper or from the screen of TV set is definitely **individual, personal** process. Therefore, the introduction of the **VPS** will give essential boost for the production and selling additional VCR's and TV sets like previous situation in auto car business demonstrates when additionally to family car many families bought personal cars as well. The introduction of the **VPS** will also initiate the design, production, and selling some special new combinations of standard TV products like, for example lap-top TV sets with VC (CD) player (or VCR).

It is important to mention that the implementation of **VPS** will save a lot of publicly available bandwidth for air, wireless transmission because the broadcasting of the **VPS** TV programs may be implemented at night time on the same TV channels when regular TV broadcasting for direct watching is essentially restricted on them.

It is necessary especially underline finally that the creation of the **VPS** will have extremely new and important impact not only on the market but it will have, hopefully, very essential influence on the social-political life of the society as well. The introduction and nationwide and worldwide implementation of the **VPS** and its products is capable potentially to enrich community and personal intellectual life, to change the share of TV sets watching time in some desirable social direction, to increase the **active** and **social productive** portion of this time for TV **reading, studying, training** and accordingly to decrease the passive TV contemplation which sometimes leads to some sort of dullness. More than this, the **VPS** potentially can transform **drastically** the advertising business on TV.

Let's say that concept of the **VPS** will change the way of the improvement for libraries and archives as far as the **VPS** is the **cheapest** and the most **democratic** way to accumulate, disseminate and deliver the knowledge and arts in the most expressive visual forms available for the absolute majority of the global population. Finally, it's necessary to underline that the **VPS** technology is environmentally clean, recycled technology capable widely safe not only a lot of the natural resources needed for production papers and inks but will save the energy for production these redundant products.

Some general additional remarks to the White Paper

Video Publication Service - A new Interactive TV public service, TV (video) Publishing House, TV Public Library, Personal TV (video) Book

More than 95% of Americans households have no little than 1 TV Set,
More than 88% of Americans households have VCR.

(the whole number of Americans subscribed to on-line computer service - smaller than 10 million, essentially smaller number have Web connection)

Three ways of VPS off-line dissemination and distribution:

- 1) broadcasting;
- 2) cable channel (direct and pay-per-view) ;
- 3) video cassette shop or mail.

The sound track on videotape is able to carry: $20,000/60=333$ bytes;
when one TV frame carries $640 \times 480 \times 24=960,000$ bytes

And one page of printed text: $64 \times 54=3456$ bytes.

The musical notes on personal TV book.

TV broadcasting is a real information superhighway with the information productivity 0.5 Gbytes/sec with no need for any wire or cable connection.

New video publishing products for personal interactive use - the consolidation of the text, graphics, still images, motion pictures clips with sound: video news paper, video magazine, video catalog, video booklet, video textbook (slow rotation of the object for 3D visualization), video manuals.

Finally, what VPS will do with publishing printed industry is close what photo (TV) technology has done to painting art - this mass technology does not destroy the paper printing art but captures some more share from publication (printed) market.

April 3, 1992

The text of interrupted public comments by Dmitry Novik at PCAST Meeting October 23, 2009:

“As Russian proverb says: “*It was not fortune then misfortune helped*”, American analogue is “*No pain no gain*”. We have tremendous misfortune and unspeakable pain. The national tragedy is that we lost badly educated the **whole generation** (from 1970 by Bruce Fuchs remarks yesterday and by today remarks by Secretary Duncan), if we would loose one more – it would be farce as another proverb says. Our public schools are broken.

It's a lot what to do to reverse the situation for the better, to transform misfortune into fortune and pain into gains. I would like to emphasize the most necessary two of them.

First – return the strong influence, care and control by parents, adult members of the family, to motivate and encourage their kids for successful graduation from high school. High school diploma in XXI century and beyond is the must. It is how I propose to achieve it: ***Each child who is born in the USA should receive to the day of his/her 3-year birthday from the Federal Government the gift of the check on 10,000 dollars that would be put on the name of that child in the 15 years bond issued by the Federal Government. At the day of 18-year birthday the child should receive the accumulated money from such bond if and only if the child and his/her parents have been matched to the following requirements – he/she has been enrolled in the all 3 levels of public schools and successfully graduated from public high school. In the case when such requirements are not matched the accumulated money from bond are put in a special Federal trust fund that can and should be used by the Federal Government only and exclusively to additional finance support of improvements day care services, pediatric medical services and public schools.***

Society hires every child for the job to be educated and graduated from public high school paying for all expenses for hi/her education and graduation. To learn, to be educated is a very serious and hard work - not fun, not cool. As for every hard work the child graduated from high school must be rewarded. The accumulated money from his/her personal 15-years bond can be used by child only for his/her higher education or vocational education to become professional worker.

The detailed description of such measure is in the attached letter to Secretary Duncan (2 pages) and “ONE IDEA THAT NOT ONLY MIGHT BUT SHOULD CHANGE AMERICA FOR THE BETTER” (4 pages), PERSONAL LETTER-APPEAL TO SENATORS OBAMA AND BIDEN (9 pages) as well as in “BACK TO BASICS IN THE AFTERMATH OF THE TRAGIC EVENTS SEPTEMBER 11, 2001” mentioned in the letter to Secretary Duncan.

Second – as we can not help to woman to give birth of healthy child earlier then around 9 months pregnancy we can not educate and graduate a child earlier than his/her 12K. And if we can not use the technology means and tools to change features of birthed child we not only can but should to use innovative effective and efficient learning technological tools and means to increase the quality of education. I proposed as far as in 1992 as such innovative learning technology the interactive personal video (TV) text book (PVTB). Detailed description of such PVTB, its features and its new potential capabilities for the most effective and efficient education and learning science and math in high school as well as for the higher education and learning are in the attached letter to Secretary Duncan on VPS text book (4 pages), **WHITE PAPER “Video Publication Service – New Interactive TV Public Services [TV (Video) Publishing House, TV Public Library, Personal TV (Video) Book]”** (7 pages) and in “Addition to the VPS’ WP” (6 pages).

Effective using the PVTB can transform the standard method of education in class (at least for middle school and higher) into the seminar type of Q&A session moderated by teacher after students read according part, pages PVTB at home.

Please, please help me to help you, Members of PCAST to give to President Obama and his Secretary of Education Duncan sound scientific and technological advice and judgments for changing the education policy.”

Please forward this e-mail with all attachments to it to all Members of PCAST and put for the public record and use at the WEB page of PCAST. Any questions might be e-mailed to dnovik@verizon.net It is my obligation to answer all of them.

Thank you all for your time, attention, critique and questions.