



## **STEM Forum 2006**

*A Community Conversation on Science, Technology, Engineering, and  
Mathematics (STEM) Education and Careers*

A program supported, in part, by a SUNY Conversations in the Disciplines grant.

Thursday, December 7, 2006

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**Outreach, Instructional Quality, and Instructional Technology**

**2006 STEM Forum**  
*A Community Conversation on Science, Technology, Engineering, and  
Mathematics (STEM) Education and Careers*

Executive Summary

*Dialogue*, the capacity of members of a team to suspend assumptions and enter into a genuine thinking together...*Dialogue* differs from the more common notion of *discussion* which has its roots with percussion and concussion, literally a heaving of ideas back and forth in a winner take all competition. *Peter Senge*

The spirit in which we invited people to participate in this program is very much explained by the notion of a *dialogue*. We invited them -- friends and colleagues, educators and entrepreneurs, scholars and employers, all of whom have a stake in science, technology, engineering and mathematics education and career engagement -- to engage in genuine and creative thinking about engaging students in STEM education and careers.

This program was comprised of two plenary sessions and a participant roundtable discussion. The **first plenary session** included a lead **speaker** who, in about 20 minutes, addressed that session's topic. They were followed by **panelists** who provided further K-12, college/university, community and business perspectives (about 5 minutes each).

In the **participant roundtable discussion** all participants had an opportunity for small-group dialogue about the program's topics. Each roundtable had a **facilitator** and a **reporter**. The number of people in each roundtable was determined by the total number of participants.

The **second plenary session** entailed reports from each of the **participant roundtables** (about 2 - 3 minutes each, again, depended upon the number of participants), along with a summary/synthesis from a selected moderator and speaker. **Roundtable reporters** were asked to summarize the key issues and action items generated.

Further aligning education, business and our community resources — particularly in literacy, technology, math, engineering and the sciences — is indispensable in the new global economy to support growth and replicate success. Improving communication and connectivity between education, workforce development and economic development efforts must be our priority if we are to successfully address the workforce crisis. Therefore, the Plenary Panel and Roundtable Discussions addressed two presenting questions:

1. What are the near- and long-term challenges associated with STEM workforce development in response to the current and emerging world marketplace?
2. How can we leverage our region's considerable K-12, college/university, community, business and public resources to further develop a STEM workforce prepared for the emerging global marketplace: What is our action agenda?

## Conclusions of the STEM Forum

### Aspects of the Forum that were especially well received include:

- The panel and small group discussions were very helpful in generating many ideas.
- Allowing people to self-select small groups and the ability to interact with everyone in roundtable discussions created a relaxed atmosphere.
- Many attendees appreciated the educators, business and government leaders giving varied perspectives on the same topic.
- The Forum brought communities together around STEM fields, discussions revealed distinct cultures and perspectives each participant came from and provided hope that different communities *can* be brought together.
- Collaborative action on all levels will be most effective and very useful.

### Areas to consider for next year:

- Perhaps focus on business partnerships whereby educators and businesses actually pair up and work on a partnership plan.
- Maybe hear more from businesses and more discussion with the private sector was brought up in order to develop concrete resources that people can tap into and find out who is will to do what.
- Create break-out/follow-up committees on specific challenges that could help in getting from discussion of action items to action of the action items.

## STEM Forum Participants

Company Name	Title
Sam Anderson	Unknown
Anna Endreny	Unknown
Frank Livoti	Prog Coord. Training
<b>Anoplate Corporation</b>	
Jeff Smith	Director, HR
<b>Baruch Hsiang Associates</b>	
Marjory Baruch	President
<b>Blessed Sacrament School</b>	
Sheila Corbishley	Unknown
<b>Broome Community College</b>	
John Gerty	Professor
Julia Peacock	Dean of Applied Sciences
Harold Trimm	Chair of Chemistry
<b>Bx the Book</b>	
Robert Mattucci	Plumbing Instructor
<b>Carnegie Learning</b>	
Robert Bone	Regional Accounts Manager
<b>Cayuga Community College</b>	
Philip Gover	Interim President
Christie Waters	Chair, Science, Math, Tech.
<b>Cayuga Works Career Center</b>	
Edward (Ted) Herring	Director
<b>Cayuga-Cortland Workforce Investment Board</b>	
Judy Davison	Director
<b>Cazenovia College</b>	
Donald McCrimmon, Ph.D.	VP for Academic Affairs and Dean
<b>Central Square Central School District</b>	
Luke Carnicelli	Principal
Carolyn Costello	Superintendent
Tim Harrison	Biology/Ecology Teacher

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Executive Principal

Pat Zeleznock

Head Counselor

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**CNYTDO**

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**DeRuyter High School**

Tom Hennigan

Science Teacher

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Donna DeSiato

Superintendent

**Fabius-Pompey Central School District**

Robert Hughes

Principal

Marty Swenson

Superintendent

**Fayetteville-Manlius School District**

Corliss Kaiser

Unknown

Anita Pisano

Asst Sup for Instruction

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<b>G.W. Fowler High School</b>	
Susan Aloï	Teacher
Joseph Boronczyk	Science Teacher
Sherri Finch	Unknown
Timothy Fitzpatrick	Teacher
Jacqueline Leroy	Teacher
Stacey Levin	Counselor
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<b>Greater Syracuse Chamber of Commerce</b>	
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Darlene Kerr	President
<b>Hezel Associates</b>	
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Alice Kendrick	Superintendent of Schools
Peter Smith	Director of Curriculum
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Happy McClurg	Math Teacher
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**Lockheed Martin**

Mike Busco	Business Partner
Ken George	Director
Oliver Liu	Engineering Manager

**MACNY**

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Kristen Heath	Unknown

**MedTech Association**

Heather Erickson	President
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**Metropolitan Development Association**

Daniel Young	Dir - Workforce Development
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**Monroe Community College**

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Sally Terek

Director - Interactive Education

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Dawn Nier  
Ellen Schwartz

Program Director  
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## **Appendix A**

## STEM Action Plan

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The following is based, in part, on information generated by 180 educators, professionals, and community leaders through the 2006 STEM Forum: **A Community Conversation on Science, Technology, Engineering, and Mathematics (STEM) Education and Careers**

Hosted by the SUNY College of Environmental Science and Forestry in cooperation with the *Journey to Jobs Workforce* initiative.

8:30 a.m. – 2:00 p.m. / Thursday, December 7, 2006  
Rosamond Gifford Zoo at Burnet Park

***We have a moral responsibility to positively affect the quality of life in Central New York.***

Dr. Cornelius B. Murphy, Jr., President, SUNY ESF

## Vision

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Marshal the resources in our region's K-12, college/university, business, community, and public institutions to collaboratively develop a STEM workforce prepared for the emerging global marketplace.

## Goal

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- Engage young people in science, technology, engineering and mathematics (STEM) education and careers.
- Engage people employed (or who can be employed) in STEM careers in continuing professional education opportunities.
- Establish mechanisms for inter-institutional and cross-sector leadership and collaboration for STEM educational and workforce development.

## Action Steps

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1. Continue the STEM Forum (and related programs) as a *caldron* of ideas, relationships and programs that support STEM education and careers.
2. Create inter-institutional and cross-sector professional exchanges for students, teachers and professionals such as sabbaticals, internships, mentoring and study programs.
3. Promote the development of regional and institution-based scholarship programs to support young people interested in STEM Careers.
4. Make industry, business, public and educational resources and facilities available to students and educators at all levels for student learning and professional development experiences.
5. Encourage industry, business, public and educational organizations throughout our region to establish an Outreach designee or liaison who will help to make connections and develop relationships supportive of STEM educational curriculum and workforce development.
6. Promote examples of successful STEM professionals and educators and their best practices to K-12 schools and to the community at large throughout our region.

## STEM Forum Action Steps

Participants were asked to leverage synergy among and between our region's K-12, college/university, business, community, and public resources to develop a STEM workforce prepared for the emerging global marketplace. In doing this, they were to create potential action steps that can impact STEM education and career engagement in significant ways. The top three action items from each group are listed here.

### *Set 1*

- 1) How do we engage young people in STEM ED careers?
  - math & science & technology education should be promoted as fields of discovery – science summer camps/further dev. of engineering clubs
  - development of career centers in our schools that promote business partnerships, internships, and other programs that bring students in touch with real life applications of STEM fields
  - public education is the most standardized in history/ESF in the High School/Project Lead the Way through RIT
    - > many of our most intuitive programs are not strapped by state assessment
- 2) How can we continue to provide employment opportunities in STEM careers?
  - provide higher education opportunities to community STEM leaders and employers
  - promote employment outreach programs between K-12 schools, businesses and colleges
  - focus on career fairs with STEM industry as well as college fairs
- 3) Establish a mechanism for cross-over STEM leadership
  - promote our collaborative success stories
  - stress networking
  - invite business into schools

### *Set 2*

- 1) Require a master's degree in the discipline taught for 9-12 STEM teachers vs. masters in education
- 2) Really connect teachers to business via internships for them – keep relevance to the real world to teachers (protect pay)
- 3) PILOT
  - Bus. people design the educ. Program
  - Teachers – not from traditional background
  - Access – track students

### *Set 3*

- 1) Provide teachers with professional development opportunities that help them get students to think critically in STEM disciplines and contextualize lessons in regional issues
- 2) Recommendation that all teachers including elementary ed. Teachers have courses on how to teach math and science as a requirement of their certification.

Encourage district to set priorities to hire elementary teachers that have come in to teach science and math.

- 3) Networking – create an inter-business and school relationship to share info.

#### *Set 4*

- 1) Provide monetary incentives for students to do well in STEM
  - bonuses for completion of h.s. courses
  - free education at the community college level
  - special scholarships to complete higher degrees
- 2) Increase interactions between business and industry and teachers. Business professionals need to help teachers understand and communicate the relevance of STEM subjects to what they do. Offer students internship experiences.
- 3) Elementary education majors don't see the relevance of learning advanced mathematics themselves. Some have math phobia. We need continuing education for teachers to help them build skills in math and science. Consider raising requirements for certification. Teacher education programs are beginning to address this but we need to do more. There should also be more team teaching to take advantage of the best STEM teachers, and there should be more "teachers helping teachers" programs that identify STEM teachers to mentor others.

#### *Set 5*

- 1) Improving opportunities for prof/students to participate effectively in public service/schools – clearing house for connections
- 2) Require more content in teacher education, 6 credits in each content area for elementary teachers
- 3) More positive images of science/engineer. As heroes in newspapers? Posters/billboards of local/national science heroes. Enhance work ethic TV stories, include education. Extending school days (in the city!) with more opportunity for doing homework, doing hands on activities, having professionals share.

#### *Set 6*

- 1) Issue: Year round, targeted and continuation funding of programs – esp. for underrep. in STEM (job shadowing, pulling them thru entire education/mentoring [ex TSTT, Penn 2+2+2 jobs in summer promised], STEM & C-STEP, better education makes you adaptable when industries need change)
  - Action:
    - continuation of funding
    - prog: exposure, contextual, follow up/mentor clubs, summer pull thru to a job
- 2) Issue: Effects of public perceptions driven by media (economy, wanting to live in this area, when the jobs are vs. what skill sets are required for those jobs, brain drain?, if our HE institutions attract so many of-of-state students then how do we keep them

Action:

- better mutual understanding in job category loss equated to readership
  - forums to invite media to lay out facts
  - press releases to highlight jobs
  - communications plan to “create” the news. Make it newsworthy
  - model – 40 below group
- 3) Issue: Funding flexibility (short term, differential funding for high cost programs in HE, sustained programs for STEM, C-STEP, benchmarking other states relative to high cost STEM/health program

Action:

- \$90K for 25 students for 2 years as a model, copy given to table member – available from Upstate – private/public/partnership

#### *Set 7*

- 1) Changing perceptions about opportunity in CNY region
  - coordinate job fairs, corporate recruiting, progress edition for attracting attention of target audience
  - > job fairs timed better for students – we want to retain (avoid conflict with final exams) good standard
  - > progress edition timed for people coming back to CNY during holidays; available online always
  - stop negative talk and thinking about why people come to CNY
  - coordinate dissemination of info on CNY cultural assets - current info is fragmented and doesn't project full richness of regional culture.
- 2) Creating more opportunity in CNY region
  - focused on attracting and retaining STEM talent
  - internships at large and small companies (> large companies helping small companies to retain talent)
  - helping small companies offer the kinds of salaries and benefits to attract/retain people
  - > larger companies supporting development of smaller companies

#### *Set 8*

- 1) Provide opportunities for girls earlier in elementary school to experience STEM and STEM careers. This will help build more self-confidence, less self-defeatist talk. Teachers need to be aware of their part in encouraging girls that they can do STEM.
- 2) Career planning needs to occur in elementary school and continue through refinement in middle and high school to allow students to see their pathway to a career. This will allow them to see the importance of STEM in their career and not be allowed to shy away from STEM.
- 3) Changing the [school] environment that it is not cool to be smart. Highlighting students to excel academically especially those that are part of the “middle” academically. Districts need to focus as much on academics as they do on sports. Marketing campaigns need to be established for this as they have perpetuated the problem,

- provide more Masters programs for the private sector needs
- work with workforce boards to identify county initiatives that need more training

*Set 9*

- 1) Highlight relevance of STEM to real life problems and issues to make STEM appealing to school children
  - enable access to information about corporations and careers for teachers, guidance counselors and students
- 2) Develop a resource list of corporations willing to work with teachers, guidance counselors and students
  - visit classrooms, guest speakers
  - field trips, tours
  - job shadowing
  - internships
  - materials and resources
- 3) Encourage industry to host teachers, guidance counselors and students to spend time in and with industry
  - provide on-going opportunities for orientation to STEM careers and difficult-to-fill jobs
    - i. workshops for teachers and guidance counselors featuring STEM professionals
    - ii. existing assn – sponsorship by corporations and government agencies

*Set 10*

- 1) Career Exploration Programs; more exposure to different careers
  - career chats
  - job shadow experiences with local businesses
  - paid internships
- 2) Establish more dual credit college courses at no cost to students
- 3) Put more science, engineering and math extra-curricular activities in place to inspire, challenge and motivate our students – provide funding

*Set 11*

- 1) Spark student interest
  - role models
  - mentors/adopt a class
  - professional development in STEM areas for guidance counselors
  - relate teaching with real world/combine theory with practice
- 2) Improve teacher working conditions
  - reduce teaching load, especially first four years
  - increase budgets with supplements from business/industry

- 3) Continuing education for teachers (professional development)
  - paid internships with business/industry
  - supplements teaching salary and keeps one current in field
  - incentives to “spark”/same spark for students

*Set 12*

- 1) Strengthen STEM curriculum in NYS schools. Bring in professionals to let students K-12 know where and how and what they are learning is used. Math education should be connected to current life context.
- 2) Give high school counselors tools to connect to corporations in the communities as to types of work available and how STEM disciplines connect. Also use corporations to provide internships for high school students.
- 3) Economics – Pushing down financial incentives for students in STEM disciplines into the colleges. Start with state Senators to fund students in STEM disciplines.

*Set 13*

- 1) Improve student’s knowledge of opportunities that exist in technology-based workplace. Possible methods:
  - Virtual Learning System: Companies post virtual tour of their facility/job opportunities on their website which can then be accessed by schools and students
  - job fairs
  - more internships
- 2) Business/industry could have designated educational outreach department – tax credits for state to support
- 3) At state level, change emphasis that is currently placed on ELA/math to include science
  - program such as ECLIPSE (Enhancing Collaborative Leadership for Improved Performance in Science Education) - inquiry-based science education
  - incorporate museums and other informal science venues into the educational process in a more meaningful way – “make sciences fun”

*Set 14*

- 1) Establish long-term relationships and professional partnerships with school district business such as Lockheed Martin, Bristol
  - job shadowing, “what’s in it for me” for business
- 2) Utilize the training facilities and equipment at the school district for day time learning for students and after school use for small businesses. Create and “Incubator Center.”
- 3) Establish internships for teachers and students in the sciences workforce – “adapt a school” by businesses, establish mentors from business and/or from higher educational institutions
  - “create summer camps”

*Set 15*

- 1) Reality check
- 2) Expand professional development in STEM for teachers using industry resources
- 3) Surveys or locate research on lack of follow through

*Set 16*

- 1) Advanced credentialing of teachers:
  - developing excellent professional practice by continuous, rewarded professional development similar to doctors and relate that to pay
  - also raise pre-service standards for entry level teacher at all grade levels
  - professional development would not only include credentials, but would include requirements for peer review
- 2) Electronic clearinghouse for posting of best practices for STEM
  - program, linkages to business, career ladders, curriculum, community partnership models = renewed, credible measured
- 3) De-compartmentalize STEM disciplines:
  - currently in US we teach STEM “rule wide, inch deep”
  - not beginning higher order of critical thinking skills early enough to be able to reach a completely level current with today’s employment market
  - [conduct as a pilot program] suggestion is that we adopt a more progressive curriculum model and testing this in a real empirical way

*Set 17*

- 1) Develop a grass roots effort to promote and support STEM initiatives:
  - policy makers, educators, parents, business community and students
- 2) Incentives to attract the best and brightest educators in the STEM areas. Relief in credentialing to allow those with work experience to become teachers.
- 3) Collaboration with policy makers to assist with shorter turn around on assessments in order to address deficiencies.

*Set 18*

- 1) Contextualization/reality based instruction to enhance the relevance, practicality, satisfaction and benefit of STEM related careers
- 2) Decrease size of middle school STEM courses to provide more attention, coaching, practice and recognition (how to find more STEM teachers to do this?)
- 3) Articulate relevant career paths for STEM-related jobs and careers to guide curriculum development, practices, course selection and college selection.

*Set 19*

- 1) Recognize industry plays key supportive/financial role
- 2) “Technology coaches” – paid like sports coaches!
- 3) “Champion of STEM” to scout schools (like college sports scout).

### *Set 20*

- 1) Mentoring:
  - teachers within discipline (partner also elementary teachers with math and science teachers)
  - students at higher grades mentor younger ones (ex. elementary kids to into middle school class to learn about microscopes)
- 2) Clearinghouse to share science materials from businesses and colleges (giveaways, loans); HS science classes can visit college campuses to do labs – helps fill in gaps in what resources are available in schools
- 3) Keep track (database?) of students who are interested in science and technology so they can be provided knowledge and guidance on pursuing college and careers in science (career pathways and HS academic plan linked here)

### *Set 21*

- 1) Enhance college partnerships:
  - pre-service – increase region in STEM fields
  - tutorials by students
  - sciences clubs for students and teachers
  - PD and enrichment of curriculum for current teachers (i.e. summer institute, professional development schools, trade schools)
  - loan forgiveness for teachers in STEM fields
- 2) Enhance business partnerships:
  - internships
  - alignment of coursework with real world jobs
  - business partnerships
- 3) Enhance/increase student motivation and exposure to college as early as elementary school:
  - college students return to their previous schools to talk to current students
  - AVID, GearUp, Liberty Partnership, Project Lead the Way
  - offer college courses in HS on campus (AP, SUPA, IB)
  - mentoring
  - SLC's

### *Set 22*

- 1) Establish a list/document and have available online and as reference book for guidance counselors and teachers of willing businesses, industries, governmental agencies and medical facilities that provide: job shadowing (for students and teachers), internships, guest speakers, career days, tours and field trips, after school program speakers, materials and resources.
- 2) If business/industry etc. are so in need, then they need to make connections to schools and students and teachers a priority.
- 3) If STEM is priority and necessary for individuals and our country's future, then connections need to be made between each of the 3 sectors here today (business and government, academic university and colleges, and public schools-high school and middle school). We discussed the disconnectedness and lack of these 3 sectors. Very little connections between business and high school and the university/colleges and business/real world, and universities/colleges and schools. All need improvement.

*Set 23*

- 1) Major scientific achievement, prestige in math/science, \$ government, think nationally
- 2) Begin movement at the corporate level. Get major corporation to fund opportunities.
- 3) Strengthen math curriculum not just how but the why. Real world application – eliminate the stigma. Strengthen communication between college expectations and high school prep.

*Set 24*

- 1) ESF Outreach and NASSMC to form NY's coalition or perhaps a CNY one (NY + CA may be too diverse for one coal. to cover state)
- 2) Science scouts like sporting scouts (Boenheim)
- 3) Role models (goal for schools and goal for kids to engage)