Good morning, ladies and gentlemen.

More than ever today, elementary and secondary educators want to graduate all students with the competence, skill and knowledge that they will need for their and our future. Although that has always been a hallmark principle of American education, we seem not to be able to achieve it consistently across the spectrum. And with the increasing diversity of our population, the challenge is growing rather than diminishing.

As everyone in this room knows, we need the entire continuum of STEM workers, from technician to educator to researcher ---ready to take on the world…And we need well-educated civil and civic-minded citizens. That means we need all of our K-12 students to be interested in and prepared in the STEM subjects.

No surprise then that quantitative Goals 1, 2 and 3 and qualitative goals b and c of the STEM plan deal with that desired and desirable outcome. So here they are on the screen…I am sure you know them by heart..

Goal 1: Increase student interest in STEM.

Goal 2: Increase STEM achievement among PreK-12 students.

Goal 3 Increase the percentage of students who demonstrate readiness for college level study in STEM fields

and then Qualitative Goals

b. Academic Coherence

c. Educator Development

So now a little background music:
PK-12 educators are used to transitions. Our students experience them several times, depending on the grade configuration of the school system. Typically we in the schools speak and plan with each other to achieve alignment and continuity…but when students graduate from high school there is a gap caused not just by geography, dispersion and two separate Departments of Education!

That gap is one element of what we are addressing today. Higher education and PK-12 education need to be better connected and to share knowledge and resources. In short higher education needs to be more involved at all levels of PK-12, not just high school where the convergence typically is.

WHAT ARE SOME OF THE CHALLENGES TO ACHIEVING THESE GOALS?

This should come as no surprise to anyone in this room…There are at least half a dozen reasons:

1. While many superintendents and principals are now aware of the urgency of STEM, they are not necessarily able to do anything about that.

2. We do not start early enough…

The Aspire Institute at Wheelock College convened a large number of faculty and administrators from public and private higher education institutions, including community colleges. The report dated May 2010 makes a number of recommendation some of which are already in process.

3. We are not capturing the interest of the diverse population of students we educate: we need to ensure that we provide appropriately to interest women and males of all persuasions. The handouts in your folder from the Donahue Institute displaying the data for the first four goals support some progress but there is still work to do.

4. Educator preparation has not caught up to the current urgency.

5. STE require investment in capital expenditures and continued maintenance. In this time of scarcity, this is a major not just a simple obstacle. A couple of years ago, one of the superintendents asked through the list serve if anyone knew what should be included in a new high school and/or middle school science lab…There was no such template available….we put out a suggested list to provide some guidance. This is here higher education faculty can consult. And such a list should not need to be invented individually by each school system--- which is another issue altogether.

6. STEM requirements for graduation from high school are changing through influence and advocacy rather than mandating. Schools still have the autonomy to develop their own instructional programs.

We have the Massachusetts High School Program of Studies (MassCore) intended to help high school graduates arrive at college or the workplace well prepared and to reduce the number of students taking remedial courses in college (another major issue). BTW, DESE has a PP on its website about MassCore that is very good and could be useful when trying to convince anyone who doesn't already understand the urgency.

With regard to STEM MassCore recommends four years of Math, three years of a lab-based Science…MassCore also describes additional learning opportunities including AP classes, dual enrollment, a senior project, online courses for high school or college credit, and service or work-based learning.

Recently an issue was brought to the attention of the MASS which we hope can be resolved through the STEM Advisory Council and which DHE is working on: Technology/Engineering courses taken for science credit in high school are not being accepted as lab science courses for college admission by state colleges and universities. This makes high schools question the value of these courses which are essential to the STEM pipeline.

Another area where action is occurring is in the Department of Early Education and Care which is integrating STEM into PD initiatives, inc. regional Educator/Provider Support (EPS) networks.

6. The current curriculum frameworks/standards are not complete: We do have curriculum frameworks in Mathematics, Science and Technology/Engineering, but the Technology standards for students are only recommended.

And very few schools actually teach engineering.

Higher ed faculty can and should be called upon to serve on curriculum development committees in the PK-12 schools. And they should participate on accreditation committees and maintain the relationship afterwards.

7. An immediate challenge is related to good news. In 2010 we had one thousand more students expressing interest in STEM than the year before. Many of us who have been working on this issue for years wanted to declare victory. However the challenge has just begun: how do we get those 1000 students (75% seniors and 25% juniors) to stay with STEM through their higher education days?

When this question was raised after the numbers were released by the Donahue Institute which conducted the review, some people responded: no problem, capacity exists in our higher ed institutions.

But there is an issue: what is the meaning of capacity in this case? Do we have enough labs and enough faculty to educate this additional number? Have we thought about mentoring these students? Giving them exposure to industry? Getting them to start and stay in STEM in higher ed? This is a challenge we face right now, this coming year.

Conclusion:

I have maintained for a long time that we collectively know what needs to be done and even in many cases how to do it….what we have not had is the

will and, perhaps, the capacity...we do not reward the connection between HE and PK-12; we do not encourage it as a regular enterprise so that when it happens it is due to the hard work of particular people. Higher education faculty need to be given permission/rewarded for work with PK-12 and 12 PK-12 faculty need to feel that what they receive from higher education is based on an understanding and appreciation of the experience of PK-schools.

This is not rocket science. Framingham State University, at the urging of a colleague who was a superintendent, is now offering a Master of Education with a concentration in STEM for Teachers in Grades 1-6. That only took a couple of years.

What do we need is more of what we already know how to do and do well:

•Internships for HS students and teachers in higher ed labs during the summer and continuing throughout the year (s)

Since 1978 Boston University has run a program for high school students who take physics in their junior year. They work in science labs in the summer and stay connected with their mentors for years after that.

And it has run a program funded at one time by NSF to bring high school teachers into labs to do research during the summer, maintaining the relationship with those faculty for a long time… the teachers become part the professional network in STEM disciplines, learn some of the advanced techniques of the discipline and continue to call upon the University for

assistance to enhance their instruction and to maintain connection with the frontiers of research in the discipline.

We do not have to reinvent what we already have that is working. We need to disseminate, adopt and expand. And we need to explore further and develop new possibilities, relationships, opportunities…and we need to do it together starting today.