

Concluding Comments from the California State University Mathematics and Science Teacher Summit

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My responsibility at the end of this good meeting is to provide a summary of the important points that you made throughout the summit and to suggest an agenda for moving forward. It is encouraging to see such a large and distinguished group of people concerned with the shortage of math and science teachers who are needed to meet critical national and social needs.

As Dr. Larry Papay told us during lunch, the National Academy of Sciences Study, *Rising Above the Gathering Storm* (<http://www.nap.edu/catalog/11463.html>), presents a discouraging picture of how far our country has deteriorated in comparison to much of the rest of the world in the education of math and science students. We also have been strongly reminded by Thomas L. Friedman's book, *The World Is Flat: A Brief History of the Twenty-first Century*, that we live in an age when all the world is our economic and social stage. Distance is no longer a protection from economic competition. Thus the decline in the numbers of math and science teachers amounts to a national security issue of substantially greater import than middle-eastern wars or even the global war on terror. We must develop plans to increase the number of math and science (MS) teachers we produce or lose our pre-eminent position in the world and the accompanying economic advantages.

We should all be thankful to the leaders of the Boeing Corporation and Southern California Edison both for suggesting this meeting today and for financing it. I am grateful to my colleagues from Humboldt State University (Drs. Elizabeth Burroughs, James Howard, Chris Hopper, Cathleen Rafferty and Jeffrey White) who joined me here today for suggestions and ideas for this presentation.

I will first review a number a reasons why the state of California and our nation finds itself in such a precarious position. Young people are not attracted to teaching because

the compensation teachers receive is not competitive. In the past, the teaching workforce was predominantly female, primarily because there were few other career options available to women. As such, starting wages were low and have never kept pace with other professions. Additionally, the low status accorded to teaching, budget constraints, and external pressures makes it challenging to attract and retain good teachers.

Furthermore, we need to recognize that individuals educated in math and science can demand higher salaries in other professions. Thus we may need to compensate them differentially relative to other teaching disciplines. This idea is generally opposed by labor unions who were not represented at today's meeting. Whatever you think of the role of unions in our society, they are players, and we must work with them.

I was encouraged by the description of dual employment options for mathematics and science teachers described by President Warren Baker, Cal Poly, San Luis Obispo. Under this plan, mathematics and science teachers would be provided with summer employment as scientists and mathematicians in a variety of government and industry labs that would not only provide them with additional compensation but also keep them excited about and current in their discipline. I also would encourage industry to consider endowing mathematics and science teaching positions in K-12 schools. Such endowments could augment the salaries provided by the public sector and would carry substantial prestige just as endowed chairs do for university professors.

In California we have three strong systems of higher education in the community colleges, the California State University (CSU) and the University of California. However, despite the fact that the CSU produces a majority of the credentialed teachers, it is often placed at a disadvantage in comparison with the other two public systems when business and state resources are allocated. It is time for our business and government leaders to invest more fully in the CSU if they really want to increase the number of mathematics and science teachers in our state.

The governments of our state and nation are in crisis because, in my opinion, we no longer have a truly representational system. The predominance of the initiative system in California has resulted in a failure of the state to invest as it once did in all levels of education (and other important social programs) as a consequence of several disastrous citizen initiatives. If we are going to continue the level of retirement and medical

benefits to maintain the attractiveness of public employment, we must have additional state revenue to support education. Business especially should take a leadership role in working with government leaders to encourage the development of ways to increase state resources. Their bottom lines depend upon having an educated workforce and MS teachers are critical to that objective. Academia also needs to learn from business. While public education cannot and should not be a business, it can certainly learn from successful businesses like Boeing and Southern California Edison about ways to use our resources effectively.

My colleague, Dr. Jeffrey White, gave me a copy of a recent report from the Education Commission of the States (Eight Questions on Teacher Preparation: What Does the Research Say?,

http://www.ecs.org/ecsmain.asp?page=/html/publications/home_publications.asp)

summarizing the status of research on the effectiveness of various factors in teacher education. I was shocked to learn that existing research on the efficacy of factors like the role of subject knowledge, academic major, and pedagogical coursework find only modest support in the existing literature. This is not to say that these and other factors are not important; only that we do not have the research to support our general belief in these factors. How can we expect our government leaders to make good educational policy when academia has not produced the research required to show what really works? Moreover, my colleagues tell me that such research often treats teachers as subjects rather than collaborators in the research process. This needs to change.

The last reason I cite for our failure to educate enough MS teachers lies firmly in the academy. The world has changed since most professors were undergraduates, yet we often act as if our universities are the same as they were when we were students. In particular, many students, especially those in the CSU, work long hours outside the university to make money for tuition. Many students transfer from community colleges and sometimes receive little counseling about options for a career. The requirements of our programs for becoming a teacher often do not consider the needs of students. Many of these requirements are dictated by the California Commission on Teacher Credentialing and other external credentialing agencies. If Colleges of Education had more flexibility, we could be more creative about program demands. For example, a

student who is a junior majoring in a science and who decides to become a teacher faces at least one and sometimes two additional years of education beyond the four or more typically five years s/he would spend to obtain a bachelors degree because of credentialing requirements. When a young person faces the additional years required to become a teacher and the additional costs involved and the relatively low level of compensation s/he will receive, it is not surprising that many of them do not opt to become teachers. The CSU needs to examine and change its requirements to accommodate students who do not decide to become a teacher until later in their college years. One of the solutions to this problem is the broader adoption of blended programs that combine academic content with pedagogical experience.

How can we address our pressing need for more MS teachers in this country? President Jolene Koester, CSU Northridge, used a word that was once an anathema in higher education – marketing. We need to recognize that one of the most effective ways our society has to change its culture is marketing. Often the most creative material seen on our media are commercials. We need to consult with students about the best ways to influence their career choices and market MS teaching to them. Furthermore, we should make use of the faculty marketing expertise that exists in our business schools to design information that will educate our students about teaching.

The CSU has begun a partnership with the Parent Institute for Quality Education (PIQE) whose mission is to educate parents, especially from underrepresented and economically challenged groups, about ways that they can ensure that their children receive a good education and are encouraged to get a college degree. We need to work with PIQE to make MS teaching a part of their educational agenda.

Earlier in this meeting, we saw a chart in Susan Hackwood’s talk that showed the truly Byzantine pathways that lead to a teaching credential in California. This system needs to be re-evaluated based on the needs of our nation and state and the circumstances our students currently encounter.

Dr. Hackwood also pointed out that state programs designed to affect educational patterns in California never last long enough to have much effect. The longest lasting program in our state was in place for three years. This is also another example of the failure of representational governance in California. Our state and national political

leaders need to recognize that changing the patterns of education will require long-term effort. The CSU and others should do all they can to encourage government to take the long view on the education of MS teachers and education in general.

For many years, some quarters of higher education largely ignored the K-12 system in designing programs to produce teachers. That has changed, but we can do better. I encourage all of us to develop P-16 Councils in our regions to work together to attract more students into the professions of mathematics and science teaching. We can also work to expand the existing partnerships we have with school systems in our area as described by Presidents Weber and Welty for the San Diego and Fresno regions.

As mentioned earlier, we need to learn from business. While public education is not a business, we can profit from using more business approaches in what we do if we are to make the most effective use of our resources. Change in higher education is a slow and painful process. Our slow pace of adopting computing technology is a glaring example. The changing lives of students often means that they cannot come to a traditional class especially during business hours. However, the use of online education to serve our students is being adopted very slowly by the academy. Students who are potential MS teachers will be attracted by technological approaches to their education. The CSU needs to put increasing emphasis on the development of online programs for all disciplines but especially for the sciences, and we need to do it with a system-wide approach. Only such an approach will take advantage of the dispersed strengths that exist on the 23 campuses of our great university.

We have made progress today, but we need to do something that the academy often fails to do – hold ourselves accountable for change. I suggest that we reconvene this group in a year and review our progress on the issues mentioned above, and others that I have missed. We can also include many more people from additional groups in this session if we make better use of technology. I ask you to take action on your campus to make some of the changes that we have discussed and also to educate your colleagues about the critical need for more mathematics and science teachers. Thank you for all that you are doing and for your understanding of the importance of our agenda.