

Archived Information

THE NATIONAL COMMISSION ON MATHEMATICS AND SCIENCE TEACHING FOR THE 21ST CENTURY

MINUTES OF THE MEETING OF SEPTEMBER 23, 1999

Commission Members Present:

Sen. John Glenn, Chairperson	Sen. Edward M. Kennedy
Deborah Loewenberg Ball	Paul L. Kimmelman
Diane J. Briars	William E. Kirwan
Rep. Cynthia Moore Chestnut	Maria Alicia Lopez-Freeman
Gov. James E. Geringer	Rep. Connie Morella
Javier Gonzalez	Dennis Van Roekel
Jerilyn Grignon	Chang-Lin Tien
Jeffrey Himmelstein	Sec. Richard W. Riley (ex officio)
Rep. Rush Holt	Neal F. Lane (ex-officio)
N. Gerry House	Jerome F. Smith, Jr. (ex officio)
Gov. James B. Hunt, Jr.	Linda P. Rosen, Designated Federal Official
Anne Jolly	

Other Attendees:

Laura Chow (for Sen. Edward M. Kennedy)
Kelley Coyner (for Sec. Rodney F. Slater)
Carlene Ellis (for Craig R. Barrett)
Peter Falestra (for Sec. Bill Richardson)
Alice Gill (for Sandra Feldman)
Susan Hattan (for Sen. James M. Jeffords)
Jay Labov (for Bruce Alberts)
Charles Meadows (for Walter E. Massey)
Frank Owens (for Daniel S. Goldin)
Danica Petroschius (for Sen. Edward M. Kennedy)
Sherrie Preische (for Rep. Rush Holt)
Samuel Rodriguez (for Sec. Bill Richardson)
Judy Sunley (for Rita R. Colwell)
Lisa Towne (for Neal F. Lane)
Sandy Zimmet (for Rep. Connie Morella)

PROCEEDINGS

Opening Remarks

The National Commission on Mathematics and Science Teaching for the 21st Century met on September 23, 1999, at the Washington Court Hotel in Washington, DC. In accordance with the provisions of Public Law 92-463, the meeting was open to the public. Rosen, Executive Director and Designated Federal Official of the Commission, called the meeting to order at 9:15 am and welcomed members. She then turned the meeting over to Senator Glenn, Chairman of the Commission.

Senator Glenn made opening remarks and discussed the goals for the day. He said that the implications of what the Commission members were about to embark upon cannot be overestimated. It is a new time, a time when the world economy and world competition increases daily, and the U.S education system, particularly math and science, is not doing well. It is regretful that the efforts of previous reports and commissions had not resulted in more action in the school system, nevertheless, this Commission comes at a critical time. Whereas most nations have a national education system, the U.S. has a system of 15,000 independent school boards, most getting elected on the promise of not raising taxes. This will not suffice. There must be a new emphasis on areas where student achievement is lagging.

Glenn described this as the first of probably five meetings between now and next September resulting in a report to Secretary Riley on September 30, 2000.

The goals for today are: 1) to have a shared vision of what the Commission means by high quality math and science teaching; 2) to have an understanding of teacher quality as an important leverage point to raise student achievement; 3) to agree on the ways to work together; (4) to reach a preliminary understanding of supply and demand issues of math and science teachers; and 6) to discuss plans for the next meeting.

Senator Glenn informed the participants that the meeting was being recorded in accordance with the Federal Advisory Committee Act (FACA). Senator Glenn noted the agenda had been revised to accommodate Secretary Riley's schedule. He then asked Senator Kennedy to speak.

Senator Kennedy began his remarks saying that the Commission is fortunate to have John Glenn leading the group. He noted that Glenn worked closely with the Senate Committee on Education during his 24 years in the Senate. He went on to say that the members of the Commission comprise a diverse group and, as a Commission, are poised to make an important contribution to the national dialogue. One of the exciting things in the make-up of the Commission is that members can look forward to taking the recommendations and implementing them. The importance of this is underlined by the Eisenhower Program, a \$335 million math-science program, which the Congress is very close to blockgranting and turning back to the states without the accountability in terms of math-science teachers. Even while the meeting is underway, the fate of this program is a reminder of the potential for retreat before having a chance to advance. Further, the demands of children today are much greater than they have ever been. Senator Kennedy said he hoped, as the members looked through this agenda, that the

full range of the challenges society faces and the increased demands children are placing on our educational system is recognized. Senator Kennedy then thanked Senator Glenn.

Senator Glenn introduced Dr. James W. Stigler, Professor of Psychology at the University of California at Los Angeles and Director of the Third International Mathematics and Science Study (TIMSS) Videotape Study. He commented that Dr. Stigler's study pioneered the use of multi-media technology.

Presentation: Improving the Quality of Teaching in Mathematics and Science – Dr. James W. Stigler

Dr. Stigler opened his remarks by noting that teaching is important and what happens in classrooms is important. If one looks at reform efforts over the past 20 years, most have not focused on improving teaching in the classroom. There has been a lot of effort on changing the political structure, effort on putting computers in schools, and setting clear learning goals and assessments. However, these efforts have not fundamentally targeted teaching and learning in classrooms. He commented that he was afraid that this Commission won't be different and he urged the members to maintain their focus on improving the quality of teaching and learning that goes on in classrooms. He warned that if the focus is shifted to questions of teacher licensure, teacher certification, and recruitment, an opportunity will be wasted. Healthcare has made remarkable gains because the professional knowledge base of medicine has grown. Likewise, a way must be found to shift the focus from the teachers to teaching methods. Stigler continued that the premise of everything he was going to say was that teaching is not some magical elusive quality that can only be carried out by certain gifted individuals, teaching is something that can be studied and improved. This is the challenge that is faced today. Stigler then showed videos from his study that was part of the Third International Mathematics and Science Study (TIMSS).

The study selected national samples of classrooms in three countries -- Germany, Japan and the U.S. -- and videotaped 8th grade teachers teaching a lesson. Tapes were sent to Stigler's lab and researchers argued about what they saw on the tapes. The goals were to see what was happening in classrooms, to discover alternative teaching methods particularly in countries with high achievement like Japan, and to study the effects of policy on classroom practice. In his current study, Stigler said that more than 2,000 hours of video are being collected. He noted that multi-media software has been designed for this project.

Stigler continued that one doesn't see what's really happening in classrooms unless one takes a cross-cultural view because teaching is a highly cultural activity. The Czech teacher grades the student after he or she completes a problem at the board. The Japanese teacher begins by talking about the concepts learned in the last lesson and lets the students loose to work on problems individually and in groups. The focus is on students working on a problem they have never seen before and asking groups to report on their solutions. The teacher summarizes for the class and moves to a new problem.

This is almost never done in the U.S. Mathematicians work on problems that no one knows how to solve and exchange ideas about solutions. In the United States, there is an instantaneous view. Japanese class size is around 40 and there is no tracking by abilities until the 10th grade. Rather than act as if there is something wrong with using

standard practices, how to shift the standard U.S. practice. It was noted that in high schools today, there are two academic tracks for math instruction, whereas the current high track teaches 1/3 less math than the standard track in the 1950's.

Stigler continued that in Germany and the U.S., 99 percent of seatwork is practice while the majority of seatwork in Japan consists of activities that require invention. He said he is not recommending that U.S. teachers teach like Japanese teachers. Teaching is a complex system and the pressure is great from all components in the system, including the students. Teaching varies little within a culture and varies so greatly across cultures. Regarding diversity, the U.S. can learn a lot from cultures that have perfected techniques that tend to be especially useful in diverse situations. Stigler suggested that the U.S. has a lot to learn. Parental involvement in the U.S. is more direct, parents help their kids get the right answer. In Japan, it's indirect, parents provide a desk or time but do not actually help with the homework. He said their Japanese colleagues were shocked at parent volunteers in U.S. classrooms. Parent volunteers in U.S. operating rooms, for example, would be unthinkable. In the U.S., there is no shared language to talk about teaching, a huge problem if one is trying to improve professional knowledge. Commenting on the wars about basic skills, direct teaching or discovery learning, he said all of these approaches are sometimes good. Finally, teaching is a cultural activity, implicitly learned.

Stigler said that the third goal of his study is to look at the effect of reform in the classroom. In his study, they saw competent teachers, competently implementing limited teaching methods. A shift is needed in the methods teachers are using. The most important gains are going to be made by figuring out a way to improve the teaching methods in classrooms. The best way to recruit people is to give them a professional life, which is what occurs when teaching methods are improved. The key to long-term improvement is to figure out how to generate, accumulate and share professional knowledge. This does not exist in the U.S. today. There are three million teachers out there who are outstanding. They didn't get to be outstanding because they are well trained or because they participated in a professional knowledge base. The biggest tragedy is that there is no way to learn from those teachers. Unless a way to share this knowledge can be figured out, each teacher must start over every time.

The best method of teaching is the method that helps students learn the most. The U.S. needs to figure out a way to capture the knowledge that teachers are developing and let them generate, accumulate and share knowledge among their colleagues. One cannot go around the teachers; a disciplined study of teaching is needed. Japanese teachers participate in lesson study groups and their focus is on improving teaching in their classroom. The focus is on helping the student understand and learn. The Japanese try to improve by directly studying teaching. A teacher in Japan can buy a book written by a teacher on any lesson study.

Stigler posed, what can policymakers do? First, the emphasis on standards and assessments is very important and must be affirmed. Second, incentives need to be provided to make teachers work on improving teaching and build it into their workweek. Finally, Stigler recommended using of the kind of technology he demonstrated today. He suggested that there could be a national role in developing an archive of professional Knowledge about teaching that includes written reports, videos, and teachers' explanations about what's going on.

Stigler concluded that teaching quality can only be improved inside the classroom and only if teachers are part of this process. The nation shouldn't continue to waste the experience that teachers have. Fifty years from now, the U.S. ought to be able to say that teaching has gotten better, that there have been some real advances, which is something that cannot be said today.

Commission members posed a number of questions to Dr. Stigler. In response to a question about Germany and policymaking in Japan, Stigler responded that German teaching looks a lot like U.S. teaching and their achievement in mathematics is not that high. In Japan, feedback from teachers influences national policy through Japan's network of national schools. In response to Himmelstein's question about gifted and talented programs and special education programs in Japan, Stigler answered that special programs don't exist in Japan for the most part, although they think they need them and are studying U.S. programs. He added that in Japan, almost all the money goes to classroom teachers. Japanese schools, for example, don't have janitors or cafeteria workers. Students clean the schools and serve the lunch.

Tien commented that Japanese study groups resemble Qualities Circles, an idea that was invented in the U.S. in the 1960s in the manufacturing sector. Although not widespread in the U.S., it is a concept used in Japan.

Van Roekel noted that in the U.S., teachers are only considered to be at work when they are in front of the classroom teaching. They are not credited for the work they must do at home. Stigler commented that in Japan, it is the work of teachers not only to present lessons, but to cultivate and develop professional knowledge. This is built into their work day and week. Their work day at school is nine hours, of which four hours are in the classroom, compared to U.S. teachers who are expected to spend six hours teaching out of six and one-half or seven hours at school.

Gonzales asked about social promotion and exit exams. Stigler explained that Japanese teachers don't talk about tests, that exams are a part of Japanese life but not classroom life. No one gets held back, so social promotion does exist. Testing occurs at the end of ninth grade after which some students are put into a vocational track.

Discussion on Teaching Quality Issues

A plenary discussion of ten mathematics and science teaching quality recommendations culled from existing studies, reports, and other materials followed. Ball commented that none of the recommendations focused on instruction or on development of a professional knowledge base. Briars indicated that neither was there any mention of making images of practicing teachers available nor evidence of methods that work.

Himmelstein noted that certain recommendations ignored math and science teachers at the elementary level and that the recommendations also did not assign the Federal government any role in raising the prestige of teachers. Coyner (speaking on behalf of Secretary Slater) pointed out that business and industry can be great advocates and should be involved.

Governor Geringer noted consensus on Dr. Stigler's point that classroom teachers need to participate in the continued improvement in the classroom. He commented there is a clash of American cultures in the classroom and in business; that education has not

switched to a quality culture in taking the initiative, and in approaching and solving problems, as business has.

Meadows (on behalf of Massey) asked if the teaching of mathematics and science is better or worse than other disciplines, and suggested that the recommendations of the Commission may have broader implications and could be a model to teaching in general.

Ball noted that consensus about focusing on instruction and developing a knowledge base would help meet the challenge presented by Dr. Stigler, but that much work is needed to do that. The Commission should keep teaching in the forefront and determine the role that content knowledge of mathematics and science plays in teaching methods. She suggested that the Commission not start with the 10 recommendations previously discussed; although they are useful and support high quality mathematics and science teaching, they are not the main focus.

Sunley (speaking on behalf of Colwell) warned the Commission not to let its focus get too broad; many teachers are insufficiently immersed in mathematics and science preparation. Kimmelman noted that many Asian countries do better in meeting the NCTM standards than the U.S.

Briars commented that school districts have been concerned with improving teaching quality but the results haven't shown up in TIMSS. It is important that the Commission be aware of the amount of work it is going to take to do this and the amount of work and effort it is going to take for school districts. She continued, saying that she was looking at research and the components of quality lessons. A different image about what instruction should be and improvement of the whole process by which teachers have to learn to do that is a major challenge. She wondered how to communicate that accurately. It is not going to be a quick fix.

Himmelstein suggested there will be significant impact on principals and administrators, and recommended including the Association for Supervision and Curriculum Development (ASCD) in the loop. Gonzalez pointed out that each year there is a new educational buzzword, a new methodology that teachers are expected to adopt, but the reality is that once the teacher closes the door, the teaching is totally up to the individual. The critical issue for teachers is time; unless time can be found for teachers to share what they are doing, there will be little connection between what goes on in elementary, middle, and high schools.

Discussion ensued about the need for improvement of content knowledge for teachers of math and science. Members agreed that this is a complex problem and must have the teacher at the center to empower teachers and change the system from within. House said the Commission has to decide whether to look at teachers or teaching. One of the goals must be to look at the accountability systems. Ellis (on behalf of Barrett) agreed with looking at teaching and continued that it's not clear how to get the teacher to implement the recommendations. Ball agreed that the Commission will want to focus on teachers and suggested Stigler's system for knowledge generating may be the way to proceed. A blueprint is needed for a system that would take a different view about how knowledge about teaching is generated.

Himmelstein noted there are two populations for teachers, those in the classroom and those just starting their careers, and that different strategies, motivations, rewards, and challenges would be needed to effect needed changes and improvements in each group. Representative Chestnut suggested the focus has to be on K-16; limiting the focus to K-12 removes the responsibility of other stakeholders.

Governor Geringer said he hears many times that teachers need the gift of time. The focus is going to be at the teacher level and he suggested using the model of how the quality circle has improved business overall. He said it boils down to trusting the judgment of the person at the front. A key question is how to accomplish this without dictating how to do it. He wondered how can student achievement results be connected with what enabled them.

Kirwan wondered how the U.S. can be so far behind internationally in its K-12 education and yet so far ahead in higher education. He applauded this as a K-16 effort and recommended thinking of a way to tie learning to standards. Meadows considered the student a final authority, focusing on the question of whether or not the student is learning. It was noted that the U.S. has one-third of the world's students in college in this country.

The Commission adjourned for lunch at 12:30pm.

Discussion on How the Commission Will Do It's Work

The Commission reconvened at 1:30pm. Senator Glenn noted that since a charge from Secretary Riley asked the Commission to focus on teaching quality in K-12 math and science classrooms, higher education is included because of the component of teacher preparation. He also noted that the audience for the Commission's work will need a compelling argument to take the action steps that are being promoted.

A straw poll was suggested to decide if the presentation from Stigler and the continuous improvement model might be one of the driving forces in the Commission's thinking. Senator Glenn said he is concerned that our educational system is based on the decisions of 15,000 independent school boards, none of whom have to answer to a national standard or a state standard.

He noted that teachers must be paid a competitive salary to stay in the profession. The average teacher starting salary is \$26,000. He indicated he hoped the teaching profession could recruit and retain the best people. If the Commission doesn't address this, it may miss a chance to do something that underlies everything else being discussed. The Commission has an opportunity for a one-two punch; it must be clear about its message and must make sure the message is implemented. He suggested spending a little bit of time reflecting on what was heard from Dr. Stigler and the question of where the Commission stands on continuous improvement.

Kirwan commented if the continuous improvement strategy is the only pillar upon which to move forward, it will be insufficient. He asked if the U.S. has a cadre of teachers who have been appropriately educated. There has to be more than this one-dimensional approach. Briars responded that the heart of the message is developing a professional knowledge base about teaching with the expectation that there would be continuous

improvement of practice and the knowledge base. Himmelstein suggested looking at the length of teacher training, that teaching is a profession and an “apprenticeship” is needed, a longer time in school, with more time to acquire knowledge and experience.

Discussion ensued. Participants mentioned increased and differential pay and improving the image of teachers. Lopez-Freeman said there are existing documents that describe effective solid practice in science and math instruction. Labov (on behalf of Alberts) suggested that a clear vision of effective practice is needed. If professionalization of teaching is used as a construct, there are things that must be done with regard to the knowledge base. This would allow systematic thinking of the various components, a systems approach. Senator Glenn said he would like to see the starting pay of teachers raised so that the best can aspire to be teachers. He commented that there is a desire that everyone be equal in teaching but this philosophy is not ascribed to in other fields.

Ball suggested deferring the interest in the supports for improvement and take seriously the fact that there is not a knowledge base for effective instruction. Recruitment, retention, professional development are all important, but this Commission should take seriously this crisis situation, that an important profession such as teaching exists with so little knowledge about professional practice. She noted that the Commission has only a short time to do this work but was having an amazingly hard time talking about instruction and what it would look like to create a system that was focused on a generation of knowledge about practice. Kimmelman agreed and suggested developing an archive to capture the knowledge of teaching and create a large database that would be an accessible archive for everyone.

Ellis (on behalf of Barrett) noted that the best teachers do not get paid for how well they do the job and that the demands of the information technology field will consume all those who are talented in math and science. Briars suggested that teachers do not perceive a crisis about their knowledge base, that what may be needed is to create some dissatisfaction in people in terms of what they're already doing and provide some vivid alternative images that are successful with children in our culture. Important models are needed from U.S. culture with substantiating data. She agreed that while compensation is an issue, there are many teachers, however, for whom compensation is not an issue. She worried about putting the burden for increasing salaries on local school districts because of the inequities in tax bases. Senator Glenn said the U.S. should get away from property tax as a basis for education and that a better formula with Federal dollars added in is needed.

Governor Geringer asked what other profession receives this kind of attention. He wondered what is so different about teaching that these types of commissions and regulation are needed to the point where the outcome can be predicted. He asked if there is another way. He suggested there is a crisis because the educational system cannot deliver what business needs. Every profession has its own culture, including teaching. Teaching is not market-based or merit-based.

Commission Resources

Rosen described resources available to support the efforts of the Commission and welcomed input from members on how they want to work. The plan is to have five one-day meetings. A staff with an array of expertise is working on behalf of the Commission. Information on the Federal Advisory Committee Act (FACA) is included in the briefing

book. All meetings are open to the public and notice is posted in the Federal Register in advance. Minutes will be available. There is strong interest in public input. Staff are setting up a website which will have links to the presentations and will request feedback. Chestnut suggested forming subcommittees.

Senator Glenn introduced Secretary Riley and noted the Secretary's focus on teachers and teaching and the critical role teachers play in providing a world-class education to all students.

Presentation: The Relationship Between Teaching Quality and Higher Student Achievement in Mathematics and Science – Education Secretary Richard W. Riley

Secretary Riley thanked members for serving and said he looked forward to the Commission's recommendations. He continued that this Commission is about to embark on an important and challenging mission and he looked forward to its recommendations and action plan. He said that this is especially important because there is a vital link between quality teaching in math and science and higher student achievement. Americans are beginning to appreciate the importance of higher student achievement in math and science.

However, a change in public thinking is still needed about how these subjects are taught. Secretary Riley said he was confident this Commission will seal the link between higher student achievement in math and science and quality teaching. Almost 61 percent of teachers have some responsibility for teaching math and science during the school day. This statistic confirms that the work and recommendations of this Commission will have a significant impact on a majority of the teachers and provide much needed guidance to educators and administrators who are working to strengthen teaching in these areas.

A study by Dr. Darling-Hammond found that the most powerful and consistent predictor of student achievement in math and science is the percentage of teachers who have full certification and a major in the field they are teaching. Conversely, the strongest consistently negative predictor of student achievement is the proportion of new teachers who are uncertified and hold less than a minor in their teaching field. This is a relevant finding for the Commission to ponder since 28 percent of high school math teachers and 18 percent of science teachers do not have a major or a minor in the subject they teach. Recruitment of talented individuals is needed and they must be provided with a rigorous education to become teachers and given appropriate compensation and meaningful support.

Over the next ten years, the U.S. is facing a shortage of 2.2 million teachers. The shortage is exacerbated by the fact that many of our current math and science teachers are under qualified and leave the teaching profession at alarmingly high rates. This points to an important issue the Commission will be addressing, the relationship between teacher recruitment and teacher retention.

Secretary Riley said he was at James Logan High School in Union City, California a few weeks ago and was proud to see their system of bringing in new teachers -- BTSA [Beginning Teacher Support and Assessment] is the name of this program. These new teachers talked about how much the experienced teachers worked with them in the evenings, and sat with them in their classes, and helped them plan for their programs, and how meaningful it was. Some of these new teachers were people who had come mid-career, and had come back into teaching and needed some special help in teaching

skills. Only a small number of new teachers who had the benefit of this program left teaching in the first four or five years. Secretary Riley noted that there are ways to provide support, and they involve relationships and personal attention to young teachers coming into the classroom.

He urged the Commission to take a look at what they're doing in California. Everything possible must be done to widen the pool of qualified applicants. He said he viewed becoming a teacher as patriotic and said all of those who have thought about becoming a teacher should be encouraged to do so. He added that the standards of the teachers who are hired should be raised.

Riley said that everywhere he went he promoted national board certified teachers. He took a school bus through five southern states and in Greenville, and was given \$20,000 to provide the funds for ten teachers to become nationally board-certified teachers. He commented that he didn't know of anything that meant more to him.

Riley said he was confident this Commission will recommend real solutions to these challenges. He continued that more is known about what goes into making good teachers than about what is good teaching. There's great promise in this area and he said he hoped this Commission will focus on how to develop teaching quality. He said he believed more can be done to identify what good teaching and learning looks like and how it can be made better. The real work at the core of this Commission is in focusing on and articulating the steps that are needed to strengthen the classroom practice of math and science and he said he eagerly anticipated the recommendations.

Secretary Riley asked for comments and questions. Rep. Holt said that he wanted to commend the Secretary for calling together College and University Presidents to engage them in the effort to bring full respectability and vibrancy to the Schools of Education. Secretary Riley responded this group consisted of the Chancellors and Presidents of the entire university system. He wanted to make sure this group realized they were being counting on to elevate the place of the College of Education.

Rep. Holt continued that the Secretary's urging the Commission to focus on the quality that makes for good teaching while acknowledging other areas that matter may be helpful, and that he understood the Secretary to be saying this is where the Commission needed to place its emphasis. Secretary Riley agreed and said that not many years ago it was considered unusual to videotape teachers and see teaching take place and analyze it like a football coach analyzing a game. To have this available for teachers is absolutely wonderful and is an important part of what he wanted the Commission to do. Secretary Riley thanked the Commission.

Governor Hunt stated that education is the most important thing in our society. Education is our future and within education teaching is important. Teachers are the hardest working people in our society. They are smart and bright and they know a lot. He said he hoped everything the Commission does will be to uphold and lift up and stand behind the teachers of America.

The next presenter, Dr. Linda Darling-Hammond, the Charles E. Ducommun Professor of Teaching and Teacher Education at Stanford University and Executive Director of the National Commission on Teaching and America's Future, was introduced.

Presentation: Supply, Demand and Quality in Mathematics and Science Teaching – Dr. Linda Darling-Hammond

Dr. Darling-Hammond said there is a growing demand for teachers. Presently, there are states with a surplus of teachers and states with a teacher shortage. Part of the issue is distribution and retention. There has been an under supply of qualified math teachers for about 40 years. There are a growing number of people being hired with no license.

Dr. Darling-Hammond showed a video outlining the problems students have had without a permanent math or science teacher in Oakland, California, and the frustrations of qualified math and science teachers in getting a job in Oakland. Dr. Darling-Hammond said the shortages are self-inflicted because states and districts that haven't looked at how to recruit, attract, and retain teachers create a revolving door. In Oakland, 20 percent of their teachers leave every year because they do not feel supported. In contrast, nearby New Haven provides mentors to support new teachers. Part of the story of supply and demand is the recruitment story, the screening process that may cause bottlenecks, the unprofessional treatment of applicants, the hiring decision sometimes delayed until the school year starts, and the lack of reciprocity for licensing. There is a lot of evidence that the quality of teachers is one of the most important determinants of how students do in achievement.

Dr. Darling-Hammond continued that considerable effort should be made to ensure teachers have the tools to be effective. It's an equity issue as much as a quality issue. She reported that students in high-minority and low-income schools were much more likely to be taught by unqualified teachers. If income levels were held constant, almost all the differential in black and white achievement test scores was a function of differences in the qualifications of their teachers.

In other countries, a greater share of personnel in schools are teaching personnel rather than non-teaching personnel and the share that goes to support teachers is generally in the neighborhood of 60-70 percent of the total budget as opposed to 38 percent in the United States. It actually turns out to be more expensive to under prepare people and let them spin out again than it is to prepare people more effectively and keep them in the profession. Darling-Hammond said that the Commission will want to talk about alternate routes into teaching. The challenge is to think about supply-demand and quality in a way that makes the quality of the preparation and support integral to the task. Her research found that good teacher programs focused on curriculum development, learning and assessment, diverse learners, connecting methods to practice, and finally lots of attention to expert mentors and a longer clinical practice. Teachers must be given the tools to succeed. In good teacher education programs, people look at teaching, diagnose it and pay attention to the details of teaching and how people learn.

Discussion on Next Steps

Rosen proposed that the November 30th meeting be focused on developing a professional knowledge base that can continually be improved. She emphasized the need to involve teachers in a significant and substantial way in the process. The third meeting in late February or early March would focus on the continuum of the teacher's professional career. This would include teacher preparation, professional development, mentoring, bringing second and third career professionals into teaching, and retention. The fourth meeting in May would get to the question of how to implement these ideas, on what has to happen to make these desired outcomes come to fruition. The fifth

meeting, proposed for mid-August, would focus on shaping the final product/products, having a clear sense of the message and how to convey it. The expected date to present the findings is September 30th.

Briars said this is a good general frame overall. She continued that a discussion and an examination of what's required to support such a database was needed, but that mid-August is a tough time for teachers to have a meeting. Other members agreed that the outline was good.

Rosen said it would be helpful to work with a subset of the Commission to think about planning subsequent meetings. Sunley said it is difficult to move forward with action when the professional body of knowledge is not known. There is more concrete knowledge about teacher support. Many people think they know how to teach. The Commission needs to think about the sense of the dynamic of the ways schools might look in the future.

Ball said that it is known what knowledge is helpful and that the Commission may want to be imaginative about the form the report takes by using different modes to communicate. She said the Commission may want to consider including some vignettes of teaching or provide a graphic image of the kind of teaching being discussed. Representative Holt seconded Ball's idea and said that models of good practice are very valuable. He said the outline would work well but the community's role needed to be discussed. There is a need for local organizations to pitch in and use community resources to elevate the role and status of teachers.

Meadows suggested the recommendations be provocative, dynamic, and attention grabbing. Van Roekel said one can't just look at test scores; that giving a report card on the school, on teacher characteristics might be useful. Briars asked if there were any models from U.S. classrooms that could be used. Grignon suggested looking at the National Board for Professional Teaching Standards.

Rosen asked for a sense of agreement on the topic for the next meeting. She suggested lengthening the meeting time a bit. Further, staff would benefit from Commission members' helping to frame the agenda. Falestra (on behalf of Richardson) suggested that what is meant by professional knowledge needed to be clearly defined.

Senator Glenn said the format of the final product is going to be as important as what it says. He suggested videos and public service announcements targeted to various regions like rolling out a new product. Senator Glenn said he would like to direct a part of this to the local school boards. Labov indicated that there is more than one audience that could be targeted for the report. Lopez-Freeman seconded the need for the report to be written in compelling language.

Rosen suggested sending e-mails to members about the next meeting. She noted the Commission has the power to commission papers and bring in speakers.

Senator Glenn thanked Rosen. The meeting adjourned at 5:00pm.

This is to certify that the minutes of the September 23, 1999 meeting of the National Commission on Mathematics and Science Teaching for the 21st Century are true and accurate to the best of my knowledge.

(Signed by John Glenn)

November 30,1999

John Glenn, Chairman

Date