U.S. DEPARTMENT OF EDUCATION

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NATIONAL MATH PANEL MEETING

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The National Math Panel met in open session at the Eric P. Newman Education Center, 320 South Euclid Avenue, St. Louis, Missouri 63110, on Thursday, September 6, 2007, at 3:30 p.m.

PANEL MEMBERS:
DR. LARRY FAULKNER, CHAIR
DR. CAMILLA BENBOW, VICE CHAIR
DR. DEBORAH LOEWENBERG BALL
DR. A. WADE BOYKIN (NOT PRESENT)
DR. DOUGLAS CLEMENTS (NOT PRESENT)
DR. SUSAN EMBRETSON
DR. FRANCIS (SKIP) FENNELL
DR. BERT FRISTEDT
DR. DAVID GEARY
DR. RUSSELL GERSTEN
DR. TOM LOVELESS
DR. LIPING MA
DR. VALERIE REYNA
DR. WILFRIED SCHMID (NOT PRESENT)
DR. ROBERT SIEGLER
DR. JAMES SIMONS (NOT PRESENT)
DR. SANDRA STOTSKY
MR. VERN WILLIAMS
DR. HUNG-HSI WU

EX OFFICIO MEMBERS:
DR. IRMA ARISPE
DR. DANIEL BERCH
DR. JOAN FERRINI-MUNDY
MR. RAYMOND SIMON
DR. GROVER (RUSS) WHITEHURST

STAFF:
MS. TYRRELL FLAWN, EXECUTIVE DIRECTOR
MS. MARIAN BANFIELD
MS. IDA EBLINGER KELLEY
MS. JENNIFER GRABAN
MR. JIM YUN
MR. KYLE ALBERT

C-O-N-T-E-N-T-S

P-R-O-C-E-E-D-I-N-G-S

(3:30 p.m.)

DR. FAULKNER: (Presiding). Let me welcome everyone to the opening session of the National Mathematics Advisory Panel. The panel was created in April of 2006 by Executive Order of the President to review the best scientific evidence and to make recommendations to the President and Secretary of Education on ways to improve mathematics learning, with a particular emphasis on Algebra readiness and Algebra success.

We are here at Washington University in St. Louis, and I would like to thank the University for hosting the Eighth National Math Panel Meeting.

Since the Panel's first meeting at the National Academies in Washington, D.C., the panel has sought to hold its meetings at institutions that symbolize educational achievement, particularly in mathematics. It is fitting for the Panel to be meeting at Washington University which is a top recipient of federal, industrial and foundation research support for its programs in medicine, science, engineering and social science. Washington

University School of Medicine, founded in 1891, is ranked by U.S. News and World Report as one of the top five in the nation and its students are ranked first in terms of academic quality.

Research has always been integral to the school's mission. It pioneered bedside teaching and led in the transformation of empirical knowledge into scientific medicine. And from the school's earliest days there was the understanding that investigation and practice, are one in spirit, method and object.

We, of course, as a National Math Panel, met earlier at Fermi National Accelerator Laboratory and one of the thoughts in asking Washington University if it would host us is the idea of placing, juxtaposing really, a site that is well known in the physical sciences, with another that is well known in the life sciences, here at Washington University.

With that introduction to the University and our thanks to the University, I would like to ask if there are members of the audience who need the signing services that

are being delivered right now? If so, we will continue. If not, we will discontinue the signing services with the recognition that of course we can always re-institute them if the need arises. So, let me ask if there is a user of the signing services or users of the signing services right now in the audience? If not, we will discontinue the services.

[No Verbal Response]

DR. FAULKNER: Let me now introduce Dr. Mark Wrighton, long time friend and colleague; a fellow chemist. Mark Wrighton is the fourteenth Chancellor of Washington University in St. Louis, and has served in this position since 1995. He is a renowned chemist, with his Bachelor's Degree from Florida State and a Ph.D. from Cal Tech. Dr. Wrighton started his career at MIT as an Assistant Professor in 1973, -- '72. And over the next twenty-three years has been promoted, or was promoted to increasing levels of academic recognition in leadership at MIT. He held chairs in chemistry and then served as Provost from 1990 to 1995.

As Chancellor of Washington University in St. Louis, Dr. Wrighton is

responsible for a number of important achievements, such as a two-fold increase in undergraduate applications, 165 new endowed professorships for faculty, a newly created program in biomedical engineering, completion of thirty buildings and the successful completion of a 1.55 billion dollar campaign for student scholarships, professorships, other endowed program support and new facilities.

He serves on the boards of Brooks Automation, Cabot Corporation, the Danforth Plant Science Center and A.G. Edwards, and he is a Trustee for Barnes-Jewish Hospital, BJC Health Care, St. Louis Art Museum, the St. Louis Science Center, the St. Louis Symphony and other organizations.

Mark Wrighton is past chair of the Business Higher Education Forum and the Association of American Universities. He is a Fellow of the American Academy of Arts and Sciences and the American Association for the Advancement of Science (AAAS). From 2000 to 2006 he was a member of the National Science Board. Mark Wrighton is also the author or co-author of more than three hundred articles

in professional and scholarly journals, and served on the editorial advisory board for a number of professional journals. He holds fourteen patents.

But, as I indicated, Mark Wrighton is a long time friend and colleague. It is a pleasure to draw on his hospitality here at Washington University, and we thank him for joining us today. Mark.

DR. MARK WRIGHTON

Chancellor, Washington University

DR. WRIGHTON: Thanks for the generous words and welcome to Washington University. You are on the campus of one of the greatest medical schools. I say that with pride, but with relatively little knowledge about medicine, as my own background is in organic chemistry. And I should tell you though that it has been extremely rewarding for me in these dozen years plus that I have been at Washington University to come to know what a great resource we have, and what a great contribution we make to the Greater St. Louis community.

The work that this National Math Panel is doing is extremely important, and it

is rewarding to see so many talented and important people spending time on this important endeavor. I want to express my gratitude on behalf of many in higher education for the work that you are doing and especially to Larry Faulkner, for taking on the important role of Chair.

Just a couple of weeks ago, I had the opportunity to meet Secretary Margaret Spellings. I had the opportunity earlier to hear her speak and meet her in a kind of meet and greet situation. But, recently I was invited to be part of a delegation of college and university presidents led by Secretary Spellings to travel to Latin America. And on that trip I came away with a very strong conviction that Secretary Spellings is very effective and very, very committed to advancing education in our country, which we all recognize as so vital to our success.

Right here in St. Louis where you are meeting and not so far from this very site, we have a public school system that is struggling. In the news here there is a discussion of an examination that is given to prospective members of the Fire Department of

the City of St. Louis. The failure rate on this examination among graduates of the city schools is so significant that even the Mayor has acknowledged that we face a crisis. Things that people should know graduating from high school in this community are just not with these students.

Children who are developing, of course, become adults, and our country will only flourish if these adults are going to be competitive in the world. It is clearly an environment today where young people will face employment challenges if they do not have a great education, including mathematics.

I think back on my own experiences as a child. I remember being very interested in numbers. I started as a child. I think I was four or five years old when I decided to start writing all the numbers I could and put all of them down on a piece of paper. So, pretty soon I had this voluminous stack of papers and I wondered where it ended. And that was an exercise that caused my parents to wonder about me a little bit; who is that small nerd that they have nurtured? But, my parents were very encouraging of my

inquisitiveness and activity. Ultimately I got a chemistry set and partially damaged my bedroom with the chemical experiments, but they encouraged me a great deal. And I think that is what it takes. We need a little experimentation and support from our parents. The infrastructure that can be provided in our formal educational system is going to be vital as we look ahead.

Many people believe in the area of medicine that the physical sciences, mathematics in particular, might not be so important. But, not so far from where we are sitting right now, we are creating enormous amounts of information. We are one of the major recipients of support for human genome sequencing. And this activity alone illustrates well the importance of a strong educational experience in mathematics and physical sciences. Advances in medicine very much depend on a knowledge base that stems from the kind of investment that we need to make in our young people.

We at Washington University, of course, are privileged to have some of the strongest high school graduates enrolled, but

I know that we are looking at a very small fraction of America. And when I think of the students in the city schools, I can tell you that we face a large challenge nationally.

I hope that you will be able to bring improvement to our system. And I am very grateful that you are doing this important work. Later this afternoon I understand that the Chair of our Department of Education will be commenting in the public session. Dr. William Tate is an expert in mathematics education, and we have been fortunate to have him as a member of our faculty.

I know that this evening we will be having dinner at the St. Louis Science Center. This organization plays a vital role in our community in encouraging mathematics and science education, and I hope you have a rewarding experience there. There are many other cultural assets of our community, but I think it is really great that you will be at the Science Center, one of the top institutions of its kind in the United States.

So, thank you very much for choosing Washington University. It is a privilege to

have you on our campus, and I look forward to seeing the report and most important, the follow-up from the Secretary of Education. Thank you very much.

DR. FAULKNER: Thank you, Chancellor Wrighton.

II. ALGEBRA TEACHERS' SURVEY - FINDINGS

DR. FAULKNER: Let me begin the session now by opening the presentation on the Algebra teacher's survey. I would like to ask Tom Loveless, who will be doing the presentation, to go to the presenting area. But, let me begin by asking the Panel, when the Panel members ask questions or make comments I would like to remind you to identify yourselves as you turn on the microphones. The transcriber needs to attribute your comments for posterity and they need to know who is speaking.

Early in the panel's discussions the members recognized the need for input from Algebra teachers to inform their work. Exxon Mobil provided a generous grant for a professional survey, which was in the field last spring. And we are about to hear the results of that survey.

The chair of the subcommittee on the Algebra teacher's survey was Tom Loveless, a member of the Panel. Other members of that subcommittee included Skip Fennell, and Vern Williams, and that subcommittee is now before us. The other presenter there is Tom Hoffer, who is from the National Opinion Research Center from the University of Chicago, which is the contractor that actually carried out the survey. With that, I will turn the microphone over to Tom Loveless who will be the lead presenter.

DR. LOVELESS: Well, thank you Mister Chairman. And as Larry Faulkner just said, very early in our deliberations as a National Math Panel we decided that we did want to get the views of Algebra teachers across the United States. The way our subcommittee conducted its business is that we first drew up an outline of the questions that we wanted to be included in that survey and the outline then went out to bid, essentially. We had several firms that conduct surveys that then put in bids, and we eventually selected NORC, the National Opinion Research Center, to conduct the National Survey of Algebra

Teachers. Tom Hoffer is here to present those findings, along with members of the subcommittee. So, why don't we start with Tom Hoffer?

Just briefly, Tom is Director of the National Opinion Research Center's (NORC) Joint Center for Education Research. He has a Ph.D. in Sociology from the University of Chicago. He has worked extensively with a number of large federal databases. I will not get into their names, because it will take about an hour to read them. But, he has also co-authored some books, a book with Jim Coleman on High School Achievement, in 1982 and also Public and Private High Schools, which was published by Basic Books.

So, Tom is going to begin talking about the survey and then the rest of us will join in with different sections.

DR. FAULKNER: Before you get started I might mention that I neglected to say that Deborah Ball was a member of the subcommittee.

DR. HOFFER: Thank you for the introduction Tom. Now, I will start with just a brief introduction to the survey, give a few

technical details, and then we will go back to the subcommittee to actually go through some of the results that we have here, the highlights, if you will. There is a lot more information that we collected that we will not be able to talk about today, and we look forward to completing a final report and having that available to the Panel and other interested parties in the very near future.

The survey was designed to provide a nationally representative sample of Algebra I teachers in public schools. We sought a sample of three hundred and ten schools from lists of all schools that contained eighth grade or higher. We stratified the population of schools so that we would have representative samples of schools by their grade configuration, that is high schools, middle schools and combined middle schools and high schools. We also stratified by the demographics of the school, particularly the percentages of students that are eligible for free and reduced lunch program participation, the percentage of racial and ethnic minorities enrolled in the school, and finally, the school location, urban, suburban, rural.

Of the three hundred and ten schools selected, two hundred and fifty-eight agreed to provide rosters of their Algebra I teachers. So, we had an 83 percent cooperation rate. And of the one thousand twenty-six teachers that were identified on those rosters provided by the schools, we were able to obtain 72 percent completed questionnaires by July 1st.

So, it was very successful by survey standards. This is a good response rate, particularly in the short period of time that we had available to collect the data. So, the results we will be discussing today are based on responses from 743 Algebra I teachers in public schools across the country.

A quick demographic and background profile of the teachers, before we move on to their survey responses, indicates about 66 percent of the teachers were female. The race ethnicity background indicates 85 percent White, 6 percent Hispanic, 3 percent African-American and 3 percent Asian. Now, these numbers compare quite closely with other national surveys. We have somewhat lower representations of African-Americans in this

sample of Algebra I teachers, than seems to be the case from particularly the school and staffing survey that the U.S. Department of Education does. It is a much larger ongoing survey of teachers that publishes results on math teachers, as well as other subject areas. In that survey, they show about 8 percent African-Americans versus our 3 percent. So we are somewhat lower there. I do not have a good explanation of why that is at this point, but that is, I think, the only demographic difference of note.

The median age is forty-one years old. About a quarter of the teachers are thirty years old or younger. And about a quarter are fifty-one years or older.

In terms of the education background and education experience, about half have a masters or other advance degree. Sixty-eight percent of all teachers had a major or minor in mathematics for their undergraduate degree. I should add about a third of those who had masters or other advanced degrees had a specialization in mathematics for their graduate program. So, there are quite a few, something on the order

of probably about 20 percent I believe that do not have, of all these teachers, a specialization either at the undergraduate or graduate level in mathematics.

About 82 percent have a regular state certification, so they were not all certified. The National Board of Professional Teaching Standards has certified 12 percent of these teachers, and 83 percent report that they are highly qualified according to the *`No Child Left Behind'* criteria.

Experience is the last point here. We have about a quarter who are very new, two years or less, and about a quarter who have been teaching Algebra I for fifteen years or more. With that, I will turn it over to Tom Loveless again.

DR. LOVELESS: What we are going to do is just present an outline of the findings. The Panelists here, you should introduce yourselves for the purpose of the transcript of this hearing before you speak.

The main areas. Area number one deals with student preparation and number two, primary findings. The first finding is that there are skill and knowledge areas of

inadequate preparation, we will get into that, and then we will provide some examples of preparation problems from the viewpoint of teachers.

The second main point looked at was teachers' work-related attitudes, and there were two primary findings. The first deals with professional preparation and development, and the second with the teaching materials and curriculum that are used in classrooms.

And then finally we will be looking at findings relating to the use of instructional materials and the main challenges for teachers.

The bar graph here illustrates how teachers responded to a series of questions about how well students are prepared. This is actually a composite of fifteen different preparation items with poor being on the left hand side of the scale and excellent being on the right. You can see that for the most part, teachers indicate that their students are not very well prepared. You see a large percentage there responding in the fair down to poor category in terms of their students' preparation.

In terms of areas where preparation is less adequate, there is almost an ability-grouping phenomenon in terms of the most proficient students in mathematics in the United States taking Algebra in eighth grade. So, the eighth grade teachers felt that their students were better prepared than teachers in later grades. And so we want to note that difference.

The second finding that should be noted is that there were small differences, they were statistically significant, but they were small by school demographics. Teachers in schools with high minority student concentrations rated the preparation of their students lower than teachers in other schools.

DR. FENNELL: Skip Fennell; member of the National Math Panel. What we are looking at here are the student preparation issues as rated by teachers with a rating of poor being a one, moving to a rating of excellent being a four. And you are looking at, if you will, the top areas of concern by the seven hundred plus teachers who responded with solving word problems coming in as the greatest concern. Work with rational numbers

particularly involving operations with fractions and decimals coming in close to that. No surprise to anybody who has taught Algebra, by the way. Basic study skills, which you probably would argue is not particularly an area of mathematics, but study skills and work habits following that and then the ability, perhaps that might be an inability to use math in context as within a real world situation, indicating a concern about actually using the mathematics.

Flipping that a bit to areas that I suspect are approaching satisfaction. Higher ratings, top four, understanding of the concept of variables, ability to plot points and graph lines on a four-quadrant coordinate plane, working cooperatively with other students; again not necessarily mathematics, but relative to backgrounds of students. And then finally and rated most high, is work with whole numbers and operations involving whole numbers.

MR. WILLIAMS: I am Vern Williams, National Math Panel. The next slide pertains to teacher comments in relation to preparation issues. And as you can see it stipulates that

students need to be better prepared in basic math skills and not be so dependent on calculators. And also they would like for the first through eighth grade teachers to concentrate more on the foundations of math, so that students know their basic skills to succeed more in Algebra.

The second set of comments, again, more focus on basic skills, things such as order of operations, integers, fractions and decimals, and also study skills, and noting that students need to have a work ethic and do homework in order to succeed in Algebra. Sooner or later it does turn into hard work.

DR. FENNELL: These are areas of teacher satisfaction, which may surprise teachers. Generally speaking the survey respondents found their Algebra I textbooks to be pretty good and they were rated very favorably. For example "*the textbook includes the appropriate topics and content to teach the course*" 90 percent agree or strongly agree with that statement. Relative to resources for students who might be struggling in Algebra I, the availability of tutorial or remedial assistance rated fairly high with 74

percent fair or better, and the quality of tutorial and/or remedial help 80 percent or better.

Now we continue with teacher satisfaction with regards to Algebra I curriculum standards and assessments or tests. 70 percent rate the content standards, be they state-wise or otherwise, as good or excellent. Eighty percent rate local expectations to be about right.

Shifting a bit to professional development. With regards to opportunities for this population of teachers, 74 percent rate professional development as adequate or very helpful to them in their work.

DR. HOFFER: Tom Hoffer; NORC. We asked a number of questions about the use of different instructional materials and the first of these had to do with technological tools. For the most part teachers of Algebra I do not make extensive use of these tools that we asked about, specifically graphing calculators and computer based instructional materials. For both of these, the responses group very much toward the rarely and never side, and very few teachers use these as much

as once a week. Similarly, manipulative materials, physical objects that can be used to illustrate algebraic concepts, were used very rarely by teachers at any of the grade levels. They were used a bit more at the middle school level, but generally not much at all. Only 29 percent used them once a week or more.

This one just illustrates the representation of the graphing calculators which we thought going in would be used quite a bit more than we are seeing here. A third of the teachers reported never using graphing calculators and another third less than once a week. So, we are seeing quite minimal use of these for the most part.

DR. LOVELESS: Then we asked a series of questions dealing with challenges that teachers may have that are not related to instruction and curriculum. The first one dealt with family participation. Sixty percent of the teachers rated lack of family participation as a moderate or serious problem for their students.

The second challenge that teachers identified was mixed ability classes, and 45

percent of Algebra teachers considered that a moderate or serious problem.

And then finally the biggest challenge they identified in this regard was working with unmotivated students.

DR. BALL: Deborah Ball, member of the National Math Panel. Additionally, in the challenges that teachers reported facing, overwhelmingly as Tom just said, they reported in teaching Algebra I successfully, that they faced problems working with unmotivated students. You can see that of all the challenges they named, almost two-thirds of the teachers selected working with unmotivated students and very small percentages selected the others that are up here.

The second most frequent up there is making mathematics successful and comprehensible. This is pretty interesting because the remainder of the items selected there you can interpret to be about instruction, but the first one which is chosen much more overwhelmingly is about the challenge of working with students that do not want to learn. That is what came through.

So, overall in just wrapping up,

what we found here was that teachers overall rated their students' preparation as inadequate. They thought that the curriculum and instructional guidance that they got was reasonably good, and faced the challenge as I have just said of unmotivated students as their largest impediment in being successful as teachers.

So, what we draw from this is that at the levels prior to Algebra I, there is a need to help remedy the kinds of student deficiencies that teachers are identifying. Also, there is a need to figure out what is leading to the lack of motivation among students. It may be useful to ascertain what creates the attitude towards mathematics that teachers are finding students bring with them to ninth grade classes.

DR. LOVELESS: And with that we will take questions and discussion.

DR. FAULKNER: Questions or comments from the panel. Will you please identify yourselves.

DR. WU: Hung-Hsi Wu. I was shocked by the finding that 90 percent of the teachers thought the textbooks were good or excellent.

Textbooks are not that good and I want it on record.

DR. LOVELESS: We were also surprised by that finding.

DR. FAULKNER: Other questions or comments?

DR. WHITEHURST: Russ Whitehurst. There seems to be an inconsistency in your use of the scales to report out findings. Sometimes it is the two top levels of the scale that agree and strongly agree, which you characterize. Sometimes it is the top three. Sometimes 15 percent disagreeing is viewed in the lowest category. Sometimes essentially the same finding on the other side is viewed as a good thing. So, I think you need to pay some attention to how the four point scales are broken out and how you are characterizing the findings.

DR. SIEGLER: Bob Siegler. My question has to do with the data on calculators and software. Teachers might not use these very much either because they did not want to or because they were not available, which are two very different scenarios. Did you breakdown how frequent

each of those was as the cause of the limited to non-existent use?

DR. HOFFER: Tom Hoffer. We did not cross-classify those yet, though I think it is a very good question and needs to be addressed. I think we do have some questions about availability. I am not sure how specifically they map to the use of questions that we reported here. Good question, I will follow up on it.

DR. LOVELESS: Also just a note to the panel in terms of the observation that Russ made, which is quite correct. The full report is in the back, you will have all the raw data. Many of the decisions we made here were just for presentation purposes.

DR. FAULKNER: Other questions or comments? Bert.

DR. FRISTEDT: Bert Fristedt on the National Math Panel. I have noticed that teachers seem to find the most troublesome thing with their students to be either the motivation of the students or their previous knowledge, rather than the things that they themselves are most connected with. It is a natural human instinct to do that. Even

taking that into account on the preparation issue, the percentages are quite dramatic.

DR. FAULKNER: You want to comment on that or not?

DR. FENNELL: Sure. I think this is an excellent point, and a point that we discussed at length. In other words, like it or not the students are there, and you are charged to be the teacher of those students and you have greater control over those other things. But we are still struck with the high percentage as you noted.

DR. FAULKNER: Okay. Well, let me thank the subcommittee for making their report and thank Tom Hoffer from National Opinion Research Center for the work that was done.

III. <u>OPEN SESSION - PUBLIC COMMENT</u>

DR. FAULKNER: We are now moving into open session for public comment. The panel has, at all its locations around the country, had some opportunity for public comment on a first come, first served basis and we are continuing that tradition today. We will go down the list of people who have signed up and begin with Richard Schaar.

(A) MR. RICHARD SCHAAR

Executive Advisor, Texas Instruments, Inc.

MR. SCHAAR: Chairman Faulkner, distinguished panel members and staff, I want to thank you for allowing me the opportunity to address the National Mathematics Panel. When I appeared before you in Palo Alto, I started in 1986 and reviewed the history of calculators in mathematics education. Today I will jump forward over two decades to review conclusions from research reports on data collected during the 2006/2007 school year on a pre-Algebra and Algebra Program that TI has named Math Forward. The full research reports are in our August 20th comments, which you have. And while they have not yet been peer reviewed they are indicative of what is working effectively in the classrooms today and should be considered as such.

The Math Forward Program includes eight equally significant components. And while technology is only one, I would like to describe this component in more detail because of what you are considering at this time. In Math Forward teachers use technology daily to enhance lessons, provide students with

feedback about learning and reinforce mathematics content. Graphing calculator research that was included in our earlier comments, shows that when students use graphing calculators to visualize mathematic concepts and principles, deeper understanding results.

In addition to graphing calculators each Math Forward classroom is equipped with the TI-Navigator Wireless Classroom Network. The network links student's calculators with the teacher's computer, which is loaded with special software to allow two-way communications for instantaneous distribution of activities and formative assessment. The teacher can send questions to the student devices, and the students can return their answers allowing evaluation of student understanding. This research-based technology is uniquely designed to transform the interactions patterns and mathematics dialogue of the classroom.

With this as background I would like to give you a sampling of the Math Forward results for the past school year. In Richardson, Texas, where the program began,

the district assumed management of their Math Forward program and expanded it to five middle schools and pilot classes in ninth grade Algebra. Forty-six percent of the middle school Math Forward students passed the state test, who had not passed it in 2006, as compared to 32 percent in the comparison group. Similarly 57 percent of the Math Forward Algebra students attained proficiency in 2007, while the comparison group had a 34 percent pass rate.

In addition to Richardson, Texas Instruments began to gain experience with scaling Math Forward in other school districts with the addition of middle school pilot programs in Euclid, Ohio, West Palm Beach, Florida and Dallas, Texas. In both Euclid and West Palm Beach the Math Forward students did better against a proficiency measure than the comparison students. Only in the Dallas pilot program were the results mixed. For a number of reasons the implementations were incomplete. So, while the Math Forward eighth grade students showed greater gains in a pass rate than a comparison group, the seventh grade Math Forward students did not.

As Texas Instruments enters year three with these results as a basis for action, we will follow four paths with regard to Math Forward. Scalability. The intention is to expand the program both within districts and geographically. Sustainability. The goal is to build internal capacity within each district. Completeness. The objective is to ensure that each program uses the eight synergistic components of the intervention making a coherent and complete whole, which maximizes student outcomes. Learning. Underpinning the entire effort is research; so, Texas Instruments has engaged SRI International, an independent, non-profit research institute, to perform independent evaluations of all sites. What is the conclusion from Math Forward for technology, both graphing calculators and the TI-navigator classroom network? These latest results have reinforced the two principles that have been governing our development path for these two decades. To achieve and sustain student performance improvement we have learned that key elements of the mathematics education system need to be addressed in a coherent

integrated way. And to be effective at improving student learning and achievement, technology needs to be integrated into a coherent and complete instructional program. When this is done technology becomes an enabler to integrated instruction, curriculum and assessment, thus resulting in increased student achievement.

What position would Texas Instruments like the National Mathematics Panel to take with regard to technology? Texas Instruments would like the panel to recognize our systemic intervention hypothesis and support additional research to improve and scale the Math Forward Program. Texas Instruments would like the panel to acknowledge that graphing technology when applied in an appropriate manner by a trained professional teacher can have a positive impact on student achievement, especially when integrated into a coherent and complete instructional program.

Thank you. Let me ask, are there any questions that you might have?

DR. FAULKNER: Thank you Mr. Schaar. Questions? Valerie.

DR. REYNA: Hello, I am Valerie Reyna of the Math Panel. A question. First of all, I acknowledge that you are going to be conducting additional research, but I noticed that you have regression, discontinuity analysis. Are you using randomized assignment? And if not, why not? And then a follow-up question would have to do with peer review. Do you intend to have the products of this research subjected to peer review and publication?

MR. SCHAAR: Yes, is the answer. And in fact, the work, -- not from this year, which literally we received two weeks ago, we have not had a chance to even start that process. But out of the work from the first year that has been presented at least, to the American Educational Research Association, I believe, but we will certainly start that process. The issue with us is we are moving rapidly and want to continue to use what we know very rapidly. And the answer for your first question is yes we are.

DR. FAULKNER: Go ahead.

DR. REYNA: Just a clarification. Was the yes about the regression,

discontinuity versus randomized assignment? So, are you using randomized assignment as control group randomly assigned experiments or are you using just comparisons with statistical controls?

MR. SCHAAR: We are using the regression analysis and I believe on the comparison; but let me get back to you on that. I am not the researcher and so therefore we have someone behind me whom I think is taking notes very copiously from this and I will get that answer back to you.

DR. REYNA: Just to clarify, one reason I am asking you this question has to do with what the impediments to randomized experiments are in the field. I would be interested in knowing what those might be.

DR. SCHAAR: Let us get back to you with that and we can go through some of the issues that we faced in all four of the districts, because each of the districts wants to have some input into the process and that is one of the reasons we are going to use SRI International next year and do it much more independently or as independently as we can, recognizing the issues within the districts.

DR. FAULKNER: Bob Siegler.

DR. SIEGLER: Yes, your report had interesting resonance with the previous report regarding the very limited use of calculators and graphing calculators in particular, in the survey that NORC conducted. My question is when a district participated does that mean that all Algebra teachers in the district were participating or could they opt out? And if so, did you monitor the use of the calculators by the teachers and was the amount of use related to the gains that were evident in the district and grades that saw gains?

DR. SCHAAR: Well, it goes back to one of the first comments that I made, it is an eight-component program. And so the teachers could not opt out of any of the pieces of the program if they were selected to be part of the program. And certainly we monitored, and they monitored themselves with regard to the use of the technology. The numbers were kind of surprising for me. I thought the number would potentially be higher. I thought your question of is it an availability question or a non-use question, but certainly the use of the total technology

package which was graphing and the navigator system was basically used almost everyday. And we did specific training on that use early in the school year. And the teachers could push to the students a list of questions for the material that they had discussed the day before, get those answers back and then now start to either go on or re-teach. And so there was a much more intensive use than what I saw in those numbers.

DR. SIEGLER: Just to follow up a bit. Did the teachers who used the calculators more, did their classes show greater gains?

MR. SCHAAR: I do not know if we could separate that out. We can say that people who used the total system, their students did better than the people who used only parts of the system? So, for example, in West Palm Beach, Florida one of our pieces is you double block the students in math. In that particular district any student who had not made proficiency the previous year ended up getting double blocked, yet our students did better, because it was part of this integrated system.

In other districts we actually trained teachers who taught both Math Forward classrooms and 'non-Math Forward' classrooms and they had both access to technology and access to a lot of the teacher professional development that we had as part of the program. Still, the people using the total program did better than the ones who were using it partially.

DR. FAULKNER: Other questions?

[No Verbal Response]

DR. FAULKNER: I have one myself. You have used the phrase integrated system and things to that effect and indicated that the positive results that you could consistently demonstrate involved use of calculators in an integrated system. Could you be a little more explicit about what you mean by integrated system?

MR. SCHAAR: Certainly. It was not just the technology. I am a mathematician. I taught, for example, in Richardson, teacher content knowledge. We had people who taught them classroom management skills. We had people who came in and did other kinds of work on pedagogical knowledge.

We used some of the University of Michigan tools to evaluate the teacher's specialized content knowledge, and we put a whole program together which also included materials. So, when I talk about an integrated program you will see within the materials that I gave you the eight components of that whole structure. Technology was one of them, but an integral part of that, because it allowed, --

DR. FAULKNER: But even the technology has multiple elements, does it not?

MR. SCHAAR: Yes.

DR. FAULKNER: There are the individual calculators and then there is the networking system?

MR. SCHAAR: That is exactly right. And so that was integrated also. The teacher could use it for formative assessment. The student could use it for drill and practice. Back and forth there was an integration which allowed the teacher to see what was going on.

DR. FAULKNER: There is or is not a particular curriculum that is a part of the integrated system?

MR. SCHAAR: Well, we took the school's basic curriculum and augmented it.

Each of the proficiency measures is against the individual state's test; it is against the Texas test, the Ohio test, and the Florida test. That says you have to modify the curriculum. But what we did was take the school's curriculum as it existed and augmented it and then wrapped around it the integrated system. Does that get to what you are saying?

DR. FAULKNER: From what I have heard you say, -- and just let me ask you to say yes or no about this?

MR. SCHAAR: Okay.

DR. FAULKNER: What I heard you say is that you can take the curricular approach with some variability from district to district or school to school, and you can overlay calculator use by students in the networking technology, plus teacher training elements and curricular augmentation, to produce your overall result?

MR. SCHAAR: Yes, is the answer to that question.

DR. FAULKNER: Thank you. Anything else? Vern.

MR. WILLIAMS: Vern with the

National Math Panel. Are you planning on doing any research to find out if the technology alone has a positive effect without the other parts of the eight-point program?

MR. SCHAAR: We do not know yet. We have been discussing that. The issue is separability. How do we take it apart and now get frankly, enough size in the pilot to be able to look at whatever of the eight components that we want to take a look at? So we are thinking about it. We have not decided on it yet. That would be something that we would be more than happy to take some input on and frankly some suggestions of the best way to attack that. We are certainly thinking about it but we do not have a plan yet.

DR. FAULKNER: Russ.

DR. WHITEHURST: Russ Whitehurst. Richard, this is perhaps an excessively lanky point, but as I am looking through your report it looks like you have maybe twelve classrooms involved in this study. You mentioned six intervention classrooms, but the number of comparison classrooms is not stated on your analysis.

MR. SCHAAR: Russ, we had more

than twelve classrooms, because for example, in the schools in Richardson, that is schools, right?

DR. WHITEHURST: Right.

MR. SCHAAR: In Richardson we are starting to get to the size where we can do some better analysis.

DR. WHITEHURST: Well, it says on page 2 of the year-end report in all, 194 students were enrolled in the Math Forward classes taught by the six teachers at the junior high schools. So, I am taking it then there are six teachers, there are six classrooms in the Math Forward classes and some number in the control classes. My point is just that your analysis seems to have taken the number of students as the unit of analysis, where as in fact, it is the classrooms which are the appropriate unit of analysis. So, instead of having four hundred plus participants you have twelve or so participants and your significance levels will be a lot less.

MR. SCHAAR: Okay.

DR. FAULKNER: Anything else? Dan.

DR. BERCH: Yes. Dan Berch; National Math Panel. To what extent do you assess or observe the use of technology in general, or calculators specifically, in the comparison classrooms?

MR. SCHAAR: We let them do as they had been doing. And in some cases we know technology was being used and in others cases it was not.

DR. BERCH: Okay. Are you going to make some room to try to assess that to some extent, that is whether the comparison groups or something.

MR. SCHAAR: Yes. We received this research between August the 12th and August the 14th, so we have some work to do.

DR. FAULKNER: Any last questions? We are going to have to move on here, but is there any other question?

[No Verbal Response]

DR. FAULKNER: Thank you Mr. Schaar. Second testifier is Elizabeth Gnall listed here from Ridgewood, New Jersey.

(B) ELIZABETH GNALL

Parent

MS. GNALL: *"What the best and*

wisest parent wants for their own child, must be what the community wants for all of its children," so stated John Dewey in The School and Society.

I live in the public school district of Ridgewood, New Jersey, but my district has a dirty little secret; Ridgewood Public School District is segregated. On one side of town elementary school children are taught math following the logical sequencing of topics honoring the scholarly body of mathematics. On the other part of town the math is not taught, but instead it is left for the children to discover and to construct. The math meant for grades beyond kindergarten the use of scissors or paper clips and any other object now defined as manipulative, are deemed acceptable and encouraged. Sadly this is the side of town where my children attend school.

One of my children was struggling to learn within that environment and as any parent would do I raised my concerns to the school system. But those concerns were met with the comment *"Our math is for all the children"*. Outside of the school I found a

teacher using a traditional math program who presented to my child math concepts sequentially, logically, and my child practiced, practiced, practiced. Low and behold my child learned math; understood math.

My other elementary school aged child has a knack for math, readily grasps the concepts, yet in that same school I found he was bored. Once again, I raised my concerns. But, because I live on that side of Ridgewood, the reformed math side, the TERC math side, my concerns were once again met with *"Our math is for all the children"*. The same traditional teacher using the same traditional program that helped my struggling child to no longer struggle, tutored my mathematically inclined child, advanced his skills and fed his thirst to learn and understand more, celebrating his intellect rather than leaving it behind.

From speaking to teachers seemingly handcuffed by curriculum policy and fuzzy standards; to communicating with superintendents blinded by their ideology so as to not hear valid parental concerns; to even confronting elected board of education officials with the preponderance of evidence

that they refer to as math policy is not educating all of the children; to the easy button reporters who so erroneously cover the math wars as a battle of broke mobilization versus critical thinking; to writing editorials to inform parents unaware, because grades seem fine, but hide what little is really being taught; to writing government officials as mathematical capable citizens are needed to lead our nation in the 21st Century; to creating a web-site and authoring a petition; with having to fly all the way to St. Louis to speak before this panel, all to advocate for a math education for my children, for their voices to be heard.

Across this nation parents just like me will ultimately triumph over math wars because it is our children, not the children of the state. And for our children their education is more important and held more dearly than any social, political, economic or ideological gerbil agenda.

And in Ridgewood, New Jersey reformed math programs are on the agenda. The parents in Ridgewood have been given more information, to less information, to biased

information, and it has all been delivered as if it were truly scientifically research-based information. The findings of your panel can hold great significance, but only if what you present is crystal clear information.

My husband and I are the best and wisest parents for our children. Give us a choice in math education, and we will choose a math education that is rigorous, focuses on content, is not driven by constructivist pedagogy, emphasizes the learning of mathematical facts, principles and algorithms, uses the proper language and symbolic retention of math and defines mathematical reasoning as those interconnections within mathematics.

It is the kind of math that is being taught in other parts of this nation and the world. I believe that math will provide a solid foundation for my children. So, if they desire, if they do want to become a scientist, an architect, or like their father, a Wall Street finance executive, or like their mom, an engineer, they can.

Thomas Jefferson would have wept at the thought of the mathematical ruin of the

United States of America, but I stand before you today in recognition that I will provide for the future of this great nation hope, mathematically capable kids that I have educated. And their success will be in spite of reformed math. Thank you.

DR. FAULKNER: Thank you Ms. Gnall. And let me ask if there are questions or comments? Valerie.

DR. REYNA: I just want to acknowledge that you said that you traveled all the way from New Jersey to deliver this message.

MS. GNALL: Yes, I did.

DR. REYNA: We heard you.

MS. GNALL: Thank you.

DR. FAULKNER: Other questions or comments?

[No Verbal Response]

DR. FAULKNER: Number three on the list is Steve Noble who had not checked in when this list was put together, is he here?

MR. NOBLE: Here. I checked in at the table.

DR. FAULKNER: All right.

(C) MR. STEVE NOBLE

Director, Accessibility Policy, Design Science, Inc.

MR. NOBLE: Thank you Dr. Faulkner; members of the panel. My name is Steve Noble. I am here representing Design Science. I serve as the Director of Accessibility Policy for Design Science. I also serve on the National Board for the Learning Disabilities Association of America; also serve on the U.S. Department of Education's NIMAS Development Committee. NIMAS stands for the National Instruction Materials Accessibility Standard.

I am here today talking about students with disabilities of all types and forms and in the accessibility of math instruction in the United States.

Design Science, the company I work for, is probably best known for our Math Type setting applications. Maybe some of you on the board have used the Math Type before or the Equation Editor in Microsoft Word for instance. Those are applications our company produces. More recently Design Science has been involved in research and development in the area of making math accessible. We have

received significant funding from the National Science Foundation in order to create the technology infrastructure, which is necessary to make math materials accessible for students with disabilities who use, assisted technologies. Assisted technologies have been found to be very key factor in allowing individuals with disabilities to be able to access the general curriculum.

As you probably know, in the United States we have approximately 7 million students who are served under special education. There are students beyond that who have disabilities that are served under Section 504 Plans and even those students who most likely have disabilities of some type or another, but have not been identified by school systems. So, this is a significant issue.

If you have examined the National Assessment of Educational Progress (NAEP) math scores, which I am sure you are very familiar with, you are probably aware that it shows great disparity between a population of students with disabilities and students without disabilities. Actually historically

the largest disparity that has ever been uncovered in the National Assessment of Educational Progress (NAEP) math scores has been between those two groups.

We have certainly done a lot of work in our educational communities at working at access to the general curriculum in literary content, but we still have quite a ways to go when it comes to math materials. One of the issues has to do with the fact that in the creation of universally designed instructional materials, digital content is very much a key factor, while the math instructional content that is produced in our country in the educational field, almost all math content is not accessible to students who use assisted technologies. That is because it is done in graphical inch formats, instead of math that can actually be interpreted by assisted technology.

The key technological solution is mathematical mark up language (MathML). Perhaps you have heard of MathML before. It is an open WC-3 standard worldwide web consortium that creates standards like html and xml, and it has also created the MathML standard. It

is a non-proprietary digital format made to be fully accessible from the beginning for students who happen to have the need of using assisted technology. MathML is a universally designed format. It can be certainly used as the source file for the creation of all kinds of formats for all kinds of students, not just students with disabilities, but also for other students.

Some of the key things that I point out that you can do once you have material in MathML can either be used for creation of synthetic speech applications to create spoken math. In digital environments math expressions can be highlighted as they are spoken. It changes the fonts, style and color, et cetera. It can be changed on the fly. The creation of boiler math becomes instantly available. Many other things are certainly possible once the content has been produced in MathML.

DR. FAULKNER: In fact, your time just expired. So, please wrap up.

MR. NOBLE: Okay. So, the recommendation to the panel is that in your recommendations and your final report that

whenever there are information dissemination programs that touch on math curriculum, in any way to include the essential details about how to make math a success for those with disabilities, instead of just throwing the information out there. This is really a key factor. We really need this.

Also, when it comes to math instructional content and assessments there needs to be requirements in here that MathML can be used to create these formats. That they can be made accessible for students with disabilities. And then further, that research and development in math accessibility be put forward in federal programs.

I will just stop there. Obviously, I have just touched the tip of the iceberg, but perhaps there are questions.

DR. FAULKNER: Are there questions for Mr. Noble? Bert.

DR. FRISTEDT: Bert Fristedt on the National Math Panel. In the recent past in this country we have tended to focus on what students should learn, by certain stages. Suppose we were to focus on what students were to learn but were more forgiving about when

that should be accomplished? Some say that people learn it by the end of twelfth grade what we think should be learned by the end of tenth say. Would this be of tremendous help to some of the students that you are concerned about or would it not be very relevant?

MR. NOBLE: The question does not directly touch, I think on the issue of math accessibility perhaps. Are we talking about the possibility of having perhaps different initiated standards for students who are in certain groups and have certain types of disabilities for instance?

DR. FRISTEDT: I am focusing not on more differentiated standards, but differentiated speed in which to accomplish things.

DR. NOBLE: Okay. Yes, I think that is sometimes done in individual education programs (IEPs) that are set up for students who have served under the IDEA, the Individuals With Disability Education Act. So, that is often done. I think one issue would be, from our perspective, is that many times students with disabilities have great difficulty actually understanding the

concepts, especially in higher level math because they find themselves unable to either verbalize the equations that they see on the page or they are simply incapable of seeing those equations. For instance, they may be students that are visually impaired, students that are blind and have to use synthetic speech applications or Braille to get access to those materials, so that would tend to bog down the education process for them. But if they had materials that could be accessible to them in an alternative format that can provide a level of access to them, they could perhaps be able to excel as the same level as their peers.

DR. FAULKNER: Russ.

DR. WHITEHURST: Russ Whitehurst. Could you describe what the challenges and impediments might be to adopting a math mark up language universally? And a connected cluster, whether that is the technology that underlies math symbolization in Microsoft Word? So, if I can have a word document that is based on your technology, would an assistive technology reader, when it encountered a summation sign be able to

articulate summation or is it represented graphically?

MR. NOBLE: There are different possibilities. Microsoft Word has this Equation Editor within it that our company licenses that will embed a certain type of format that can easily create MathML. MathML is not directly part of Microsoft Word as it is a proprietary format, but you can pull MathML out of that. For instance, if you use Math Type it can actually generate what is called math page technology. It can generate an html document with MathML islands in it at just the click of a button.

So, it is actually very easy to produce MathML from a Microsoft Word document, providing you have not simply copied images of math expressions, but you have actually embedded them either with Equation Editor or with Math Type or with other editors that can create MathML at the end of the process.

DR. WHITEHURST: And so, the first part of my question was, what are the impediments? I mean it seems so obvious that this would make things easier.

MR. NOBLE: Yes, indeed.

DR. WHITEHURST: So, what stands in the way?

MR. NOBLE: The major impediments we find right now as far as a nationwide adoption of this has to do with how things happen in the publishing industry. We work with many publishers of math textbooks that are so well liked by teachers, as we have just heard. And one of the issues is that those math textbooks are created on the one end we find out that probably 95 percent or more, maybe closer to 99 percent of math textbooks start out as a Microsoft Word document with Math Type equations. So, the MathML could easily be pulled out of that.

What happens in the publishing industry is that it is pulled into other types of software programs for page layout et cetera, where they get all the fancy color illustrations et cetera, put in place, and at that point the MathML is typically stripped from that because those page layout programs do not use that information. And so it is lost at that point. So, the best way to help that would be to actually get companies like Adobe, which makes some of these page layout

programs, or Quark, would be another to actually ensure that they are MathML aware. But again, they are a private company and nobody can force them to do that, I guess. But if publishers had an incentive to request or demand that Adobe and other page layout software developers actually were MathML aware, that would go a long way towards helping the problem.

DR. FAULKNER: I think we need to move forward. Is there any burning question that has to be addressed here?

[No Verbal Response]

DR. FAULKNER: Okay. Thank you very much, Mr. Noble. We need to go to the fourth presenter Marguerite Bliss from St. Louis.

(D) MS. MARGUERITE BLISS, Parent - Clayton Math Matters

MS. BLISS: Good afternoon. And thank you for the opportunity to share my comments with you today and for your time and service on this very important panel. My comments are mostly anecdotal and are based on my own experience as a parent in the Clayton, Missouri School District, just about 5 miles

down the road from here.

I became concerned about my children's math education in our school district about five years ago, when our middle daughter was in seventh grade, and I was intent on getting her moved into the honors math track. I was focused on getting her into the honors track because our district had just recently adopted Core Plus Integrated Math for non-honors students at our high school.

Honor students were and still are taught traditional math there. Our oldest daughter received an outstanding math education in the honors program. I knew little about Core Plus curriculum, except that our community was up in arms when it was approved to replace traditional math at our high school. I met with the math coordinator at our middle school to talk with her about the possibility of moving our Everyday Math and Connected Math educated seventh grade girl into the honors track, because after all she was getting straight A’s in math. The coordinator stated that our daughter was not honors material and showed me a standardized computation test she had taken the year

before. She scored 37 percent on that test. I was shocked. Our daughter had always received top grades in math.

Prior to that moment my husband and I had complete faith in our schools, believing our children were getting a fabulous math education. Our oldest daughter sure did. We bought into the teacher's claims that higher order thinking, critical thinking skills and math on the cutting edge, are the hallmarks of Everyday Math and Connected Math. We excused the homework assignments that made no sense to us or to our kids, believing that the schools knew what they were doing. Today, we are the experts. When our kids learned lattice multiplication and did not understand it, we taught them multiplication the way we knew it and still believed the school was doing the right thing. When our kids could not do long division by hand, only with a calculator, I taught them myself thinking they must have missed it in school. When I knew so many families in our district, and there are still many who send their kids to Kumon Math, I thought they were over the top parents who wanted to turn out genius kids. I had so much

faith in our school until seeing our daughter's score on that computation test from sixth grade. That was an ah-ha moment for me, the beginning of my involvement in math wars.

Our middle daughter was placed in Core Plus Integrated Math in high school. To say that we were shocked at what she brought home for homework assignments is an understatement. We could not believe the number of phone calls each night to our home from my daughter's integrated math group members who did not understand the group's assignments. Some of her more notable assignments were to write thank you notes to those in her group for their efforts in the group. Our daughter complained that she was the teacher of the group and that the paid teacher merely walked around the room and answered student's questions. She spent an entire weekend her freshman year creating a beautiful poster, cutting and pasting shapes for hours. Our fourth grader had much more rigorous homework at that time. At open house night at the high school when the math teacher stated that the best thing about integrated math is the extensive amount of group work, I

simply had enough.

I will spare you the many details of the math wars that ensued in our district over the next few months. Parents banned together to petition the district for an alternative to integrated math for our middle track students. Honors students were taught traditional math. We wanted that for our kids as well. By this time our high school junior class was in its third year of integrated math and no parent or student I knew in the curriculum was happy or had a good thing to say about it.

But, there was good news. We were successful in getting traditional math offered as an option for our middle track kids. Those students in my daughter's class who wanted to move into traditional math were told they had to take special Algebra tutoring after their first year of integrated math at the family's expense, because our non-honors students had not received much at all in the way of Algebra instruction in our schools. We were shocked once again.

Here roughly 70 percent of the freshman at our high school had received very

little Algebra instruction through three years of Connected Math in the middle school and one year of integrated math in high school.

DR. FAULKNER: You are inside your last minute, so please finish.

MS. BLISS: Just what had they been learning? Many of these were straight A students. Furthermore, we learned that if they stayed in integrated math they would not begin to focus on Algebra until their junior year.

Our school is considered to be one of the best college prep high schools in the St. Louis area. Every one of these kids was heading to college and the thought that they would not be taught Algebra until junior year was astounding.

Fortunately, our daughter, a motivated student, agreed to the special Algebra tutoring. Throughout this ordeal we enrolled our younger daughter in Kumon, now viewing it as an absolute necessity instead of an unnecessary burden inflicted on her by an overachieving parent.

It is our view that Kumon is responsible for her being in the honors track

in middle school. Our daughter who completed one year of integrated math is now in her third year of traditional math as a senior in high school. She credits the special Algebra tutoring, along with the traditional math education she has received for three years for her strong score on the math section of the ACT. Her friends who stayed in integrated math complained about their low math scores on the ACT exam. We live in a fairly wealthy community and most can afford special tutoring for these exams. The number of kids who receive that tutoring to beef up math scores is staggering.

Our district still promotes integrated math as the recommended curriculum for middle track students. The teaching staff sings its praises, while many graduates now four classes from our high school, complain bitterly about their lack of preparation for college calculus. Our district has seen an alarming increase in the percent of graduates who wind up in remedial math in college.

All of this prompted a group of parents to create a web site for parents in our district as a resource to understand the

conflicting information they hear from parents and students and teachers and administrators. Please visit our web-site claytonmathmatters.com to read feedback from graduates of the Core Plus Integrated Math curriculum. So many stories exist of our high school graduates who cannot major in business or sciences as they desire because they are lacking a solid math education.

Finally, Missouri is known as the `Show Me' State. Others and I in our district have asked our math department to `show me' the data that shows that reformed math prepares students better than traditional math. They have never been able to show me any data to convince me that these curricula are producing better math students.

DR. FAULKNER: You need to wrap up here.

MS. MARGUERITE BLISS: I believe extensive research and effective math instructional practices is needed in order to compete in our world. I believe it is irresponsible to promote curricula as exemplary and promising without thorough research on their effectiveness. Thank you

very much.

DR. FAULKNER: Thank you, Ms. Bliss. Are there questions?

[No Verbal Response]

DR. FAULKNER: Thank you. Patty Polster from Maryland Heights, Missouri is the fifth testifier.

(E) MS. PATTY POLSTER

Parent/Special Ed Teacher

MS. POLSTER: Good afternoon. Thank you for this opportunity to speak with you today and for your efforts and dedication in providing the best possible recommendations related to mathematics education in our country. I also feel the need to thank Marguerite and Liz for their representation on a parent's point of view as to what is going on in mathematics education. I am a professional educator and I am just beginning a doctorate program in educational leadership. However, I will speak to you today also as a parent and a citizen.

I believe that the single most important issue to be addressed in improving the quality of life in our country is public education. I believe that our current

educational system could achieve significantly greater outcomes for my children and for all children, by spending more time and effort in evaluating instructional practices and curricula, and less time evaluating children and diagnosing learning or behavior problems within them. I am going to ad lib here, and far less time looking for scapegoats for the curriculum, such as motivation or parents.

It is my understanding that as members of this panel you are to investigate, among other things, instructional practices, programs and materials, that are effective for improving mathematics learning, as well as a need for research in support of mathematics education. I would like to say that I am thrilled to see those items on your list of things to do and thank you for undertaking the task.

In the fourteen years that I have spent in the field of education I have found myself often puzzled and frustrated by the decisions that policy makers and professionals make when it comes to identifying and implementing best practices. So often it seems that throughout the field of education,

policies and practices are implemented with insufficient evidence of their effectiveness. Currently it seems that rather than seeking well-defined interventions for which strong empirical evidence could be accumulated, educators tend to prefer what I see as nebulous concepts or theories for which no clear measurable definition can be established and/or evaluated. Discussion of such topics then becomes philosophical and therefore personal, rather than objective.

The majority of the mathematics education programs that I have seen implemented throughout the St. Louis area seem to be based on theories, constructivist philosophy and opinions of how kids learn mathematics. I have a very hard time making sense of them. I am most familiar with Everyday Math, which is currently used in the district where I live. Given the time constraints, let me just say that I am seriously concerned by how I see my children in first and fourth grade functioning.

I am here today to ask that as you formulate your recommendations you consider the outcomes documented by the largest

educational experiment ever conducted to my knowledge, even if it was several decades ago. Project Follow-Through is still the most meaningful undertaking ever supported by the Department of Education. The results and research were and still are clear. The direct instruction model clearly came out on top in all areas measured. Direct instruction has shown significant positive impact in study after study, yet schools of education and governmental agencies still completely ignore it.

The direct instruction mathematics program designed for school implementation is called Connecting Math Concepts and is published by SRA International. It was unique in many ways. For one, it presents topics in strands rather than spiral design. Also all direct instruction programs incorporate three main components.

One, a program design that identifies concepts, rules, strategies and big ideas as well as clear communication through carefully constructed instructional program.

Two, organization of instruction including scheduling, grouping, and ongoing

progress monitoring to ensure that each student receives appropriate and sufficient instruction.

And three is student/teacher interaction techniques that assure that each student is actively engaged with instruction and masters the objectives of each lesson.

In closing, I would like to see a federally funded comparison utilizing a strong research design and taking into consideration the use of tutoring services for those programs, for any of the children involved, that compares the Connecting Math Concepts Program to any or all of the currently utilized constructivist spiral programs. If you are really brave and ambitious you should also recommend to them Project Follow Through, only this time please try to see to it that someone pays attention to the results. Thank you again for your time, efforts and dedication.

DR. FAULKNER: Thank you, Ms. Polster. Questions?

DR. FENNELL: I have actually a question for one of our Panelists. Tom, did you look at Project Follow Through?

DR. GERSTEN: I probably know more about Follow Through than anyone on the Panel. We did not look at it in part, we only looked at those past 1976, and we did not look at this type of more philosophical evaluations of different approaches to teaching. So, the answer is, it was not in our purview.

MS. POLSTER: I think it is incredibly relevant given what is happening in education today.

DR. FAULKNER: Any other discussion of that?

[No Verbal Response]

DR. FAULKNER: Okay. Thank you.

DR. LOVELESS: Let me just say one thing. Just to be clear, we did search the literature on direct instruction and other interventions since 1976. So, it is not that we did not look at direct instruction, we did.

DR. FAULKNER: The sixth testifier has cancelled, I believe. Naila Qureshi? She is not here. That brings us to seven, which is William F. Tate, IV. Edward Mallinckrodt Distinguished University Professor in Arts and Sciences and Chair, from Washington University.

(F) DR. WILLIAM F. TATE

Professor, Arts & Sciences - Washington University

DR. TATE: First let me join Chancellor Wrighton in welcoming you to Washington University here in St. Louis. Today I am testifying on behalf of the American Association of Colleges for Teacher Education (AACTE), which represents eight hundred schools, colleges and departments of education across the nation.

We recognize the nation's critical need to increase the quantity and quality of scientific personnel in order to compete in the global economy and to bolster the technical skills of our workforce to enhance creativity and innovation.

Our comments are focused on elementary and middle school K-8 mathematics according to the panel's charge, and as requested, we cite our sources of research evidence, most of which I am sure you have before you.

My remarks and our remarks today, address item “e” of the Executive Order creating the panel -- the training,

selection, placement, and professional development of teachers in mathematics in order to enhance students learning of mathematics. The American Association of Colleges for Teacher Education (AACTE) offers eight policy recommendations to the panel that we believe will significantly improve the quality of mathematics teaching and teacher preparation programs.

Recommendation one, the National Mathematics Advisory Panel should request major government support for synthesis and wide dissemination of the best research available on the teaching and learning of mathematics. This should be an ongoing service provided without charge to the public.

Recommendation two, the National Mathematics Advisory Panel should all support the research of critical mathematics teacher and teaching issues. This research should include at minimum, a description of the current status of mathematics preparation on the part of K-8 teachers, the essential content for high quality mathematics teacher preparation, the optimum length of course work and critical experiences, any combinations

thereof and research on the ideal structure, nature and synthesis of courses.

The third recommendation to the Panel is we encourage you to encourage consensus-building efforts to develop high-level mathematics standards. I may come back to that.

Recommendation four is for the National Mathematics Advisory Panel to support the development of student databases with links to teacher preparation programs. We ask the Panel to recommend the appropriation of funds sufficient for all states to develop and implement longitudinal data systems with the capacity to track the performance of individual students from year to year, link those students with their teachers, determine the impact of those teachers over several years, link those teachers to the preparation programs and ultimately identify the program characteristics associated with the greatest levels of student achievement.

Recommendation five, the panel should encourage and support teacher preparation reform at both state and federal levels.

Recommendation six, the National Math Panel should call for the elimination of out-of-field teaching. With 18 percent of middle school mathematics teachers assigned out-of-field, it is important to take a stand to discourage this practice. The Panel should recommend that all states phase out the practice of out-of-field teaching by setting a disappearing cap on the number of out-of-field placements permitted by each district, each year, until ultimately the cap becomes a ban.

Recommendation seven, the National Mathematics Advisory Panel should encourage investments in mathematics teaching, recruitment and retention efforts, given the shortage, the high rates of turnover, and out-of-field teaching, and the lopsided diversity among mathematics teachers. It is necessary to launch a concerted recruitment and retention effort. Research shows that strong induction programs with training mentors make a positive difference in the retention of novice teachers and improving teaching practices in schools. Further, growing interest exists in enabling school districts to offer schoolteachers compensation that is

more closely aligned with that available in other economic sectors. Nothing less than a federal Marshal Plan is needed to greatly enhance the recruitment and retention of excellent mathematics teachers, particularly for high need schools. Substantial funds should be authorized for a variety of promising programs.

And our final recommendation, recommendation eight, is to correct inequitable distribution of high quality teachers. The Panel's report should clearly articulate this educational travesty and insist on enforcing existing reporting requirements and the prohibition of misdistribution practices and the appropriation of funds to carry out the recruiting, retention recommendations noted above.

DR. FAULKNER: You are inside your last minute.

DR. TATE: And I am done actually. My final remark is on behalf of teacher preparation programs across the nation, I thank the Panel members for your attention and for the good work you are doing to help

improve mathematics teaching and learning. Thank you.

DR. FAULKNER: Thank you. You actually said you were going to come back to one point?

DR. TATE: Well, the national movement for creating consensus around standards. We note in our research that there are various groups attempting to do that. It is clear to us that some consensus among these groups is vitally important, and I just wanted to emphasize that consensus around standards.

DR. FAULKNER: Thank you, Professor Tate. Questions? Valerie.

DR. REYNA: Valerie Reyna; Math Panel. Professor Tate, you mention in your first item the dissemination of materials. Universities such as this one have a number of research journals that are available in on-line form, supposedly accessible. What is different about what is currently available, say through the Web of Science and other kinds than what you have in mind?

DR. TATE: Well, not only are journals online, we have syntheses in handbooks which are ad nauseam to date. The

fact is though, the disconnect between those syntheses and the public is quite high. What we are arguing and I think an important part of the recommendation, is the distribution of such syntheses that have been peer reviewed and that are disseminated freely. I think that is a big difference.

DR. FAULKNER: Deborah.

DR. BALL: Your role, not only as the Chair of the important Department of Education, but as President of the American Educational Research Association leads me to ask you a question given this very comprehensive report that you are presenting to us. You correctly identified that more knowledge is needed about teacher education, professional development, induction and so on. That will be part of what we will be reporting. What do you see as the impediments or maybe more positively said, what would it take to produce a kind of knowledge base about teacher education, retention, all those things that would have to do with building a qualified teacher core and then distributing them, but just to have that sort of knowledge? What do you think it would take? What do you

think are some of the impediments? Or what do you think it would take? How would we do more than just say more research is needed?

DR. TATE: You always ask the hard questions. I think to be really honest about this. We are sitting in the Medical School of Washington University right now, and there is a major difference in how knowledge is distributed in medical science versus what we do in education. By the way, now I have to take my hat off of the American Association of Colleges for Teacher Education (AACTE). On the record she asked me to go the American Educational Research Association (AERA), so I am not representing them any longer, it is my personal opinion.

We do not have a system in place to actually disseminate at a high level, even within colleges of education, what I would consider to be peer-reviewed work that is of the highest quality that is synthetic. That does not happen per se. Some people have testified earlier about programs that are being implemented. And part of the dilemma is the public and/or people who actually do teacher education; and that varies from

institution to institution, do not necessarily have things that are being, if you will, have the government stamp of approval for peer review that are synthetic in their hands. I cannot think of any right now. I do not think there is any. In fact the closest we have are NRC Boards, which are excellent, but that is the closest we have. We are really at an alpha level. There really is no dissemination. Recently the American Educational Research Association (AERA) has taken on writing policy briefs that synthesize research for policy makers, but there is not anything per se for public, for teacher educators and the like. It does not exist.

DR. FAULKNER: Russell.

DR. GERSTEN: For this question you could answer for either organization or as simply yourself. One of the groups here has made a decision to only include the most rigorous research and to synthesize that. Is that in line with some of your thinking?

DR. TATE: Well, you might have to help me on how you are defining rigorous.

DR. GERSTEN: In terms of via the experiments.

DR. TATE: Yes. Certainly I think that those should be included and are vitally important. I will put my American Educational Research Association (AERA) hat on for a moment. Most certainly I am appreciative of the framing that is taking place to make those kinds of studies happen more often to date and that encourages us. But I will also say that it is quite unfortunate that we know, defaulted, there is going to be a limited amount of research that is being done that way, given the way the funding streams have flowed in the past. So, by default you will come up with certain kinds of recommendations, just because there has not been an abundance of that type of work. So, that is what I would be a bit worried about.

But then again, I will say that there is other research that may not have been done that way that might be quite good and leads you in a way of triangulation if you will, if you do not mind me using that language here. But I think we do need to triangulate and look at various forces to make sense of what directions are most appropriate.

But can I say I am very pleased at

how this group has taken seriously looking at instruction materials and the design of the research associated with them, and I would encourage you to continue to do it in that way. Carefully done research programs are vitally important. And let us be honest. There has not been a lot of funding for the kind of research that has been traditionally talked about by groups like this. It just does not exist. It has not happened.

DR. FAULKNER: Anything else? Russell.

DR. GERSTEN: Thank you for your perspective. This is just a comment actually for the prior speaker about the Follow Through evaluation direct instruction. I just was going through in my mind and actually it does fit within the thirty-year limit. So, we will talk to our data analysts about that in terms of the search, because it is a government report from '76 and '77. So, we will visit that issue.

DR. FAULKNER: Anything else? Thank you Professor Tate. Next testifier is J. Martin Rochester, Curator's Distinguished Teaching Professor of Political Science at the

University of Missouri St. Louis.

(G) DR. MARTIN ROCHESTER

Professor, Political Science

University of Missouri-St. Louis

DR. ROCHESTER: Thank you for the opportunity to comment on the work of the National Math Panel and the issues at stake in this project.

I am a Professor at the University of Missouri St. Louis. I should note that I am a political scientist not a mathematician. But nonetheless I am someone who spent over thirty years as a professional educator and also as a parent observing one failure after another in K-12 education.

As every so-called progressive fashion presented as a magic bullet has only added to our shooting ourselves in the feet.

I have written about this in a book entitled Class Warfare, as well as in Education Week, Phi Delta Kappa and in other publications.

Fuzzy math, or integrated math, or whatever you want to call Everyday Math, Core Plus, and the other reformed math curricula now dominant in K-12, has been driven by the

same constructivist paradigm and the same dumbing down populist impulses that gave us the now discredited whole language pedagogy in English. That is in place of the old maxim ‘no pain, no gain’ we now have the new maxim in K to 12 ‘if it ain't fun, it can't be done.’

Under the guise of critical thinking and problem solving, which are ubiquitous buzzwords in every discipline in today's schools, fuzzy math is trying to make math more interesting; that is enjoyable and entertaining and accessible to the masses, to the bottom, to the lowest common denominator. The new math de-emphasizes and devalues direct instruction, drill and practice, basic computation skills and getting it right, getting precise correct answers. Forget rigor. The key concern here is to alleviate boredom and drudgery from math folks and those who suffer from math anxiety. Never mind we are inflicting this stuff on math folks and math-philes alike, doing a disservice to both. And never mind Isaac Newton's admonition that ‘*there is no royal road to geometry*’ meaning there no easy path, although some reformers

seem to have found it.

Most of the math professors I have spoken to at my university are appalled at the lack of basic computation skills student now bring to campus from K-12. Not surprisingly, parents have to enroll their kids increasingly in Kumon math tutoring courses to compensate for the failure of our schools to provide a solid foundation.

In my own school district of Clayton, which you have already heard another parent speak of, one of the richest and best in the entire State of Missouri and perhaps the country, dozens of parents including the president of the school board, a Harvard MBA, have resorted to Kumon math for their kids every since fuzzy math was introduced into the district.

As a college professor I can tell you that our K-12 education system in America is becoming dysfunctional, as we are turning the pre-collegiate and collegiate levels upside down. K-12 teachers pretentiously aspire to teach critical thinking in kindergarten even though Johnny cannot even find the potty. While we in higher ed are left

to clean up the mess, having to do more and more remediation. In English it means having to teach grammar and where to put the comma. In history having to teach basic historical facts, such as who Lenin was, that is Vladimir and not John. And yes in math having to teach two plus two.

Those are emperor's clothes quality to the claims made by the math reformers. I respectfully urge you to examine these claims more carefully, since they are cut out of the same cloth as all the other failed K-12 reforms of the recent past. Thank you.

DR. FAULKNER: Thank you Professor Rochester. Questions?

[No Verbal Response]

DR. FAULKNER: No questions, thank you. We now go to Jennie Winters who is with the Lake County Illinois Regional Office of Education.

(H) JENNIE WINTERS

Math & Science Coordinator

Lake County Office of Education

MS. WINTERS: Good afternoon. Thank you so much for allowing me to speak today. I am the math and science coordinator

for the Regional Office of Education in Lake County Illinois. My responsibilities include facilitating professional learning and curriculum development for forty-five school districts, which encompasses two hundred sixty-five schools and approximately eleven thousand teachers. During my interactions with these personnel, I have been able to observe much and would like to share the insights I have developed while being in the trenches.

Mathematics achievement is not about the program. Granted some programs have best practices embedded within the lesson design; however, I believe that a knowledgeable teacher can do great teaching with whatever resources are available. The key is the level of mathematical understanding the teacher possesses. Mathematics is a language used for communication in all walks of life. Unfortunately many educators do not speak the language, therefore becoming mathematically literate should be a priority for all educators to ensure the mathematical literacy of the youth of our nation.

Elementary teachers are expected to

lay the foundation of mathematical understanding so that content specialists at the middle and high school can build upon that foundation. However, elementary teachers are also expected to lay the foundation in reading, writing, science, social science, health, et cetera. It is very difficult for elementary teachers to be experts in every content area. Therefore it is essential that they have access to support personnel, who are fluent in the language of mathematics.

I am pleased to see the math specialist or math coach position emerging in some of our school districts and I would strongly encourage this Panel to support the implementation of more specialists and coaches.

Teachers also need to be comfortable in the use of differentiation to meet the variety of students that they encounter in their classes. In my observation, elementary teachers may not be content experts, but they tend to connect with their students, however one cannot effectively differentiate content without a deep understanding of that content. On the other

hand, secondary teachers see many more students for much less time, therefore they may be experts of content but it is difficult for them to make individual connections with each student. A teacher cannot effectively differentiate for students without knowledge of student's interests, learning styles and abilities.

Elementary teachers need ongoing professional learning opportunities to develop a deeper understanding of the mathematical language they are teaching. If we examine the mathematics instruction in other countries, we can learn from their successes. Let us not go out and copy their instructional programs. Once again, it is not the program. It is the fact that the instructors were taught using the terminology and techniques to develop a deep level of understanding of mathematics.

Secondary teachers should be given multiple professional learning opportunities to develop a repertoire of pre-assessment, instructional and differentiation strategies to meet the needs of their student population. They need to develop a deeper understanding of process standards so that they can delve

deeply into the content. Through professional learning opportunities both groups will gain knowledge of a plethora of research based assessment and instructional strategies in their respective areas of need.

It is my concern that special interest groups will try to influence this Panel to promote their own agendas or financial benefits. I sincerely hope that this initiative avoids the pitfalls and mistakes Reading First encountered.

Student achievement is not about the program, but it is about knowing your population and finding the appropriate resources and strategies to reach that population. It is also about affording teachers the professional learning opportunities they need to become the teachers their students need. Thank you.

DR. FAULKNER: Thank you, Ms. Winters. Questions or comments? Wu.

DR. WU: Hung-Hsi Wu. Would you consider the fact that if you happened to have a good textbook it is easier for a teacher to achieve greater things than with a bad textbook?

MS. WINTERS: Absolutely. I have been in a lot of classrooms. I do a lot of instructional walk-throughs with principals and what I see and what I hear from the teachers when they come to me, elementary teachers do not even understand it. They like the little kids. They like reading. They do not understand math. And I think my frustration is they do not even have the people to go to explain what it is they are supposed to be teaching the next day. So, it is very hard for us to expect them to lay a good foundation for these kids when they do not even have it themselves.

DR. WU: I should add that your point is well taken, the fact that everything, really it is critically on the teacher. Nevertheless I just wanted to make sure that you agree with the fact that if you do have better textbooks things are easier.

MS. WINTERS: Absolutely. We have districts that use Everyday Math and have tremendous success. We have districts that use Everyday Math and it is a flop, because of the level of understanding of the program, and the teachers of everything. I think that it

is not necessarily about the program because every district has its own issues. So, you have to find the right program to fit the right situation. And even then you might have a group of students, but that program is not going to work for them. So, it is not necessarily a program. But the teacher needs to know how to read their students. When you were talking about the Algebra group and how they always felt their students were the problem. They do not know their students well enough to be able to differentiate and meet their needs. So it is easier to blame the students because that is all they know.

DR. FAULKNER: Tom.

DR. LOVELESS: Besides Everyday Math, what are the programs that your district uses?

MS. WINTERS: I have forty-five districts that I work with, so they use a wide range. They go from Houghton Mifflin, then there are groups that have Saxon. It is just the full range. And honestly the questions are always the same from elementary. *"I do not get what it is that I am teaching, so how can I explain it to students*?" And I think

that Connected Math is very large. It is coming into the middle schools. Teachers have to understand the program before they have to go in and teach it.

DR. FENNELL: Skip Fennell; National Math Panel. I know that you mentioned your interest in the issue of the elementary math specialist. Are there multiple models that you are seeing among the districts that you work with? Is there a model that seems to be working better for some districts than others? I say that because this Panel is in fact looking at that question.

MS. WINTERS: Yes. In our office we actually facilitate a group of coaches that come together four times a year, and the math coach position is increasing every year. So, some districts have the coach where they truly go in and model. They do not have classroom responsibilities per se. They are really there to teach the teachers and be a resource for teachers. There are other districts that have them having classroom responsibilities part of the time and helping the teachers part of the time. Generally those that can be

released from the classroom and spend their time in as many classrooms as possible and really modeling and working with those teachers tend to be more successful. They feel more successful because they have the time to really improve instruction and model in as many people's rooms as possible.

DR. FENNELL: And do those folk have significant math content background?

MS. WINTERS: For the most part, yes. They have to have an endorsement in math in most of our districts.

DR. FAULKNER: Bob Siegler.

DR. SIEGLER: Yes. Your point about elementary school teacher's frequent lack of sophisticated mathematical knowledge seems very well grounded. I am wondering whether district in-service programs could not both collect data on what mathematical lessons teachers in a given grade have the most difficulty with and then address those in the in-service programs.

MS. WINTERS: We do some of that where I do surveys periodically. Again I am working with forty-five different districts and so everybody kind of does their own thing.

But when we do surveys then that is what I tend to do my workshops on regionally, on the issues with fractions, the issues with how to get students to understand the difference between problems in measurement. If the issues pop up over a range of our districts then I tend to do regional workshops on those. Extended responses on how to get students to explain their thinking is one of the big ones or problem solving.

DR. FAULKNER: Deborah then Bert.

DR. BALL: Thank you for your comments. They are very helpful and very on point. I was wondering and struck by the fact that you are working in what you said forty-five districts. You are giving us a portrait of many different districts using different programs and people doing their own things. Several meetings ago, we had a number of people speaking with us about the trade offs between the fact that within this country people choose whatever they want either within the classroom level, the school level or the district level. I think your point that teachers are central is very well taken. What difference would it make to a job like yours

if it did not face that range of programs? Even though you are saying it is not the program, what difference would it make to your job if you had a uniform program among the forty-five districts you serve?

MS. WINTERS: I think the problem with that would be that the forty-five districts have different populations. So, I do not know if I would want one unified program, because the key is certain programs fit certain populations. One of the things that I have found with working with our districts with Everyday Math, the ones that have the greatest success with it, have a continuous population. Where those that have a lot of move-ins and move-outs, no matter how well trained the staff is, it is a disaster for them because the kids do not have the background knowledge to really have success in the program. So, it really does depend on the situation. Those very mobile districts need something that is a little different than the ones that have the stability of the population.

DR. FAULKNER: Bert.

DR. FRISTEDT: Bert Fristedt; the

National Math Panel. You mentioned several times that there are many teachers who do not have the math background at the appropriate grade. Then later when you were talking about a particular middle school program, you mentioned that they do not know that program very well. That bothers me. If a person has sufficient math background they should not have to do that much preparation to handle the program. And then at another time when you talked about professional development you listed several things, but I noticed it seemed to me that you were missing math knowledge itself in the various things you listed with professional development. But if it is math knowledge that they are lacking maybe it is the professional development programs that need to change and focus on the math rather than techniques.

MS. WINTERS: I think at the elementary level the focus on the math is the biggest issue I am encountering. I think at the middle school level and at the high school level they teach out of the textbook and live out of the textbook and use the same techniques every time. They do not know a

variety of strategies. They do not get at all the process standards that they need to. They do not really facilitate communication. It is very traditional and it does not necessarily give them the knowledge of the students that they need to be able to meet the student's needs.

DR. FRISTEDT: This language bothers me. I think I am a pretty good teacher, and I do not know a single process standard, so maybe I am overlooking something.

MS. WINTERS: I am thinking well.

DR. FRISTEDT: Yes, I realize that. But still it seems I am not liking this emphasis on sort of very specific kinds of technique, that concerns me. Different people handle different things and if the book is sort of written so as to force people into a certain mold, you are going to have failures among the teachers because they will not fit that mold very well. But you can see my opinions are showing.

DR. FAULKNER: Thank you, we need to move on. We have several other questions, Liping then Vern.

DR. MA: I have a very short

question. Do you think if a teacher teaches Everyday Math or Saxon, which are at two extremes, they need common content knowledge, or do they need to have different kind of knowledge in terms of math?

MS. WINTERS: I think they need to have a common content knowledge in math. It does not really matter which program they are using. A lot of the elementary teachers whether it is Saxon that is very straightforward and procedural versus Everyday Math which is much more reasoning and theoretical, the teachers do not really have either. So, I guess my concern with the elementary teachers is most of those people are the ones who will come to me and say "*I really was not good at math when I was in school.*" So, they think that it is okay to be mathematically illiterate, which it is not.

DR. MA: So, is there only one kind of math, which if teachers know that they can teach every kind of program well.

MS. WINTERS: I think you have to have a strong foundation in mathematical understanding where you understand why math works and you understand the concepts in

geometry. If you understand conceptually about math, you can work within the constraints of pretty much any program. Granted I do think there are better programs than others but that is my personal bias. I cannot tell the districts what to do and I try to show them how to work with what they have. But I think that they are lacking that conceptual understanding of mathematics in the very beginning so they are at a loss of where even to start.

DR. FAULKNER: Vern.

MR. WILLIAMS: A couple of things. As a teacher I have a pretty good conceptual knowledge of math. That is what I do. But there are certain types of programs that I think I would have trouble teaching. That is the first point. The second question is, you said that in certain districts Everyday Math works better because the students in that district are less mobile and they evidently have a better math background to start with. So, if you take the same consideration for elementary school teachers whom you stated have very poor math backgrounds, would a program such as Saxon be a better match for

that teacher since it seems to be more focused than a program such as Everyday Math?

MS. WINTERS: I think it would have to depend on the population that they are serving. I am not trying to match the program to the teacher, I really think you need to match the program to the students, and the teacher needs to have the skills to adapt to that program. Because ultimately we are in this business for the kids we are not in the business for ourselves.

MR. WILLIAMS: But you do agree that as students have different learning styles, teachers also have different teaching styles. And some of their teaching styles match to different programs?

MS. WINTERS: Yes, I do agree to that. That is why I think it is important for them to find a district with a philosophical match to their style. But ultimately the districts that have adopted Everyday Math that love that constructivist philosophy and they will have a population of students that will still struggle with that, because that is just not a match for those students. So then it is not about the program again you need to find

something else to meet those students.

DR. FAULKNER: Sandy. This is the last question we can stand here.

DR. STOTSKY: I was struck by your comment on the difficulty that you are saying the middle schools teachers have with the Connected Mathematics Program. Could you help us understand how this program got to be chosen? Did they have a choice of what kind of program in grades 6, 7, and 8 to choose or were they all just given that program to use? How are teachers treated professionally in terms of the choice of program that a school would have for them to use?

MS. WINTERS: That is a really good question because again every district is different. This particular district the teachers did not have as much input. Certain schools had more input than others and it is a larger district. So, some of the teachers who joined the committee to choose programs really loved this program and they are having more success than the bulk of the population who did not have as much interest in joining the committee.

DR. STOTSKY: Now there were just

a few people who chose for all the rest?

MS. WINTERS: Yes. And then when you implement a new program with a new philosophy and you just thrust it upon the rest of your teachers without any professional development, it is not going to fly as well as if you would have decided to support your teachers.

DR. STOTSKY: And were they aware that there would be such costs associated with professional development for teachers who did not want or were not prepared for the program?

MS. WINTERS: Some districts are more aware of things than ours. Some know. We have some districts that really do their research. I worked with one last week that is going through curriculum adoption and they came in and really intently looked through our materials that we have in several different programs to find the one that would really match their population. And they chose two different programs for their middle school population. I do not know if you want to know what they are. But they wanted to find a variety to meet the different needs. And so that kind of a district is looking to me to

come follow up and looking to bring in the publishers to follow up and looking to do continual, continual development. Then you have the other districts that will say we are going to get this, it looks good, here you go.

DR. FAULKNER: Thank you Ms. Winters. I think the Panel would continue to ask you questions but I cannot let them.

MS. WINTERS: They have my email.

DR. FAULKNER: Thank you. Barbara Asteak is the next testifier. You will have to tell me what your pronunciation is.

MS. ASTEAK: Asteak.

DR. FAULKNER: Asteak, okay. And you are from Suntex International, it says here from Easton, Pennsylvania.

(I) MS. BARBARA ASTEAK

Suntex International

MS. ASTEAK: That is right. I came in from Easton, Pennsylvania, this morning; weather cooperated. Thank you very much.

I am Vice President of Suntex International. We are the creator of the Twenty-Four Game, a very popular mathematics

game, that was developed in 1988. I see the eyeball of recognition among some of you. We have for nearly two decades made math very exciting for children. Albert Einstein once stated "*games are the most elevated form of investigation*." We could not agree more.

The game series expanded into a series of nine different games; starting with one step addition, always the way to Algebra. Five years ago we married the games with the technology of the internet and included this program. It was the first on-line math program, and it was used last year alone by over two hundred thousand students around the United States.

This program has proven that it can reach students of all ability levels and all backgrounds. It is very engaging and interesting and the content is quite rigorous. Do not let the word “game” fool you at all.

In three years of participation, students who have been enrolled in the program are approaching solving their billionth, that is with a ‘b,’ their billionth math problem on our web site. While the Twenty-Four Game series is the backbone of the First in Math

program it also includes rigorous modules where children demonstrate mastery of basic facts in whole numbers, fractions, decimals and integers. There is also a vibrant range of bonus modules, where students work additionally on fact practice, word problems, fractions, decimals, integers, pre-Algebra problem solving and finally Algebra. In fact, we have eight skill sets and most adults in this country could not even complete skill set five. But we have thirty, fourth grade students going all the way through the Algebra modules.

Students log on to First in Math from school and from home, or wherever they have internet access. They just lately are able to expand the school day by many hours. Parents can watch those children participate, those that are fortunate enough to have the internet at home, and have an opportunity to try some of the math curriculum.

The activities on the First in Math site are designed to introduce skills on a gradient, easy to more difficult. This design makes that program a perfect tool for differentiating instruction. First in Math is

self-paced, meeting the needs of all students from intervention to gifted. Philadelphia public schools use the program as their chief mathematics intervention program. Prince George's County, Maryland uses it with all their talented and gifted students. It is aligned to rigorous national and state standards.

Wellstone, the nation's top regional educational laboratory, conducted a scientific based study about the program in National City, California, with a sample size of two thousand students. National City is the second poorest school district of its size in the state of California. The study was conclusive. It proved kids involved in the program saw a small but substantial increase in standardized test scores, on CAT-6, California Achievement Test. The study also had an attitudinal component and proved conclusively that students involved in First in Math change attitudes about math to the positive.

For educators the site provides real time continuous feedback for teachers, for building principals and for district

administrators. They can track the progress of their students through the site and determine that students are performing at grade level standards in easy to read printable reports. But perhaps the most distinguishing feature of the First in Math program is the competition element of the program. As kids log on, start solving problems, they get electronic awards stickers that accrue to a personal score but also to their classroom score. And we refer to the classroom as a team and we have provided an exciting mathematics competition. Kids compete to be the top mathematics team in their school building, in their school district, in their state and in the nation. We have provided an outstanding national mathematics competition, and teachers and principals never have to hire a bus, they never have to get a permission slip and do all the other things in having real competition.

DR. FAULKNER: You are inside the last minute, so I will ask you to wrap up.

MS. ASTEAK: All right. Unique competition has had some very outstanding results. And I will tell you the story of

Parker Annex, a very high poverty school. In Trenton, New Jersey there are fifth grade kids with no access to the internet at home. They formulated a plan to get business leaders behind them. They went to a local Best Buy, Wal-mart, Circuit City et cetera, and asked please can we come after school to do First in Math in your stores. The store managers said yes, as long as you behave and they did and they emerged the number one team out of ten thousand teams in the United States of America. Parker Annex, this is an absolute stand and deliver story. These kids are absolutely amazing, not gifted just regular kids who said we can do it.

In short, we take good old-fashioned math, turned it into the medium of the 21st century and we believe First in Math should be part of the national strategy. Thank you for giving me this opportunity.

DR. FAULKNER: Thank you Ms. Asteak.

MS. ASTEAK: Well, I will respond to anything. It is pronounced As-teak.

DR. FAULKNER: As-teak, okay. Thank you for being with us. Questions from

the Panel?

MS. ASTEAK: I assume I am the last speaker, everyone's ready for dinner.

DR. FAULKNER: You are not last.

MS. ASTEAK: Okay, well thank you very, very much.

DR. FAULKNER: Thank you Ms. Asteak. We go to the last presenter and that is Michelle Pruitt from Columbia, Missouri.

(J) MICHELLE PRUITT

Columbia - Parents for Real Math

MS. PRUITT: Good evening. I represent a parent group in Columbia, Missouri. Our community is a microcosm of the national math debate, although perhaps a late blooming one. All the players are assembled in our community for yet another season of mathematics on the verge of a nervous breakdown. The Math Education Department at the state university located in Columbia is heavily funded by the National Science Foundation to promote teacher development using particular math curricula. A number of graduate students earn master's degrees by participating in the implementation of these curricula in the public schools.

The local public school implemented these curricula in 2001 in part to gain access to university graduate students for the Columbia public schools classrooms. But who evaluates the effectiveness of these curricula? It goes without saying that the public school administrators like to present student achievement in the best possible light.

Student and faculty at Emory's math education department have published numerous papers, not surprisingly supporting the effectiveness of their own efforts; however many of these same publications have been found to lack sound research by the What Works Clearinghouse. At the same time, nationally known standard assessments of student achievement are being ignored. An eight-year record of C+ student scores on the Iowa Algebra aptitude test spanning the period of implementation of Connected Math, seems to indicate a significant drop in Algebra readiness, but it has not been carefully examined by the school district or the leaders to researchers.

ACT test scores have dropped and

the median math rates of students attending state universities have escalated since adopting these math curricula. Parents are justifiably concerned. Many parents who work at the University of Missouri in the math, engineering, food science, economic, psychology and other departments have signed a petition opposing the current math curricula used in the public schools. These scientists, engineers, mathematicians, technicians and physicians know intimately the demands of a career requiring the mastery of mathematics, and they are speaking up to say, that the local public schools are failing students who have aspirations to follow a strong career path.

Likely this particular script is all too familiar to the Panel. You have been tasked with advising the President and Secretary Spellings on the best use of scientifically based research on the teaching and learning of mathematics.

I conclude with an important point, the cliffhanger for the season. How best can evaluations of effectiveness and assessment of student performance be separated from and

independent of the development and implementation of curricula? The basic tenant of slightly adversarial, peer-reviewed research is lost when researchers are paid by textbook publishers and administrators playing dual roles implementing curricula and assessing their impact.

I thank you for the crucial and urgent work you are doing on behalf of our students, our families and our nation. Thank you very much for letting me have this time, I know it is very, very late.

DR. FAULKNER: You have more time left.

MS. PRUITT: No, that is it.

DR. FAULKNER: Are there questions or comments, Wu?

DR. WU: Just one short comment. Your point about the need for independent evaluation of curricula or other forms of educational activities is very well taken and we hope that it will be taken more seriously.

MS. PRUITT: Thank you very much.

DR. FAULKNER: Any other questions or comments?

Thank you, Ms. Pruitt.

Let me thank all of the testifiers. We always find these sessions to be quite informative and today was not an exception. The Panel will be adjourning here in just a moment. I would like to notify the audience that we are reconvening tomorrow morning at 8:30. It will not surprise you that most of the work of the Panel is going on in subcommittees and task groups. A very large amount of work has gone on in these bodies, and the subcommittees and task groups will be reporting in the session tomorrow. Quite significantly, most of the task groups will be making their main public presentation on findings and recommendations.

The work of the task groups and subcommittees forms a base for the Panel to synthesize in the last several months of this year, a Panel report, which is the report that the President and Secretary sought through the Executive Order. And I just wanted to give you a summary of where we are in this process.

But, tomorrow represents a culmination of the work that has gone on in the task groups. I will talk before the testimony tomorrow a little more about the

structure of the process we are engaged in. But, I just want to indicate to the audience that we reconvene at 8:30 tomorrow. Thank you.

(Whereupon, at 5:45 p.m. the meeting was adjourned.)