U.S. DEPARTMENT OF EDUCATION
*****

NATIONAL MATHEMATICS ADVISORY PANEL MEETING
*****

WEDNESDAY,
JUNE 28, 2006
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KENAN CENTER, UNIVERSITY OF NORTH CAROLINA
CHAPEL HILL, NORTH CAROLINA
9:00 AM
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PANEL AND EX OFFICIO MEMBERS PRESENT:
LARRY R. FAULKNER Chair
CAMILLA BENBOW Vice Chair
DEBORAH LOEWENBERG BALL Member
A. WADE BOYKIN Member
FRANCIS FENNELL Member
DAVID GEARY Member
RUSSELL GERSTEN Member
TOM LOVELESS Member
LIPEING MA Member
VALERIE REYNA Member
WILFRIED SCHMID Member
SANDRA STOTSKY Member
VERN WILLIAMS Member
HUNG-HSI WU Member
DIANE JONES Ex Officio Member
GROVER WHITEHURST Ex Officio Member

PANEL AND EX OFFICIO MEMBERS NOT PRESENT:
NANCY ICHINAGA Member
ROBERT SEIGLER Member
JIM SIMONS Member
DAN BERCH Ex Officio Member
TOM LUCE Ex Officio Member
KATIE OLSEN Ex Officio Member
RAY SIMON Ex Officio Member

STAFF MEMBERS PRESENT:
TYRRELL FLAWN Executive Director
DIANE MCCAULEY
IDA EBLINGER KELLEY
JENNIFER GRABAN
ALYSON KNAPP
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Adjourn
DR. FAULKNER: My microphone has a bell so that I can get your attention. It's, I guess, a technological virtual gathering, but let me welcome the members of the panel and guests around the room to this second gathering of the National Mathematics Advisory Panel. We are here to do our work. And we have nearly everyone who was expected to come. We've lost Tom Luce to illness, and we've lost Dan Berch to weather related travel. Tom Loveless is in town and will be with us momentarily. I think that takes care of everyone. We have some members who are not expected to be here due to assignments, Nancy Ichinaga, and Bob Siegler is by telephone. We're missing three who could not make this date. We've had two drop out, because of problems at the last minute, but everyone else is here and, I think, we can go ahead and pursue our goals.

We are in an open session, which will be largely dedicated to discussing standards of evidence methods. We'll get to that momentarily, but let me begin this session by first of all, thanking the University of North Carolina for allowing us to be on campus and for providing us with the space that we'll be using today and tomorrow. The University of North Carolina is a premier institution of higher education
in this country, and we're glad to be able to avail ourselves of their hospitality.

Actually, there's method in what we're doing with our sites. When Tyrrell asked me about sites, I said that I thought it would be good, in addition to our covering different parts of the country with our meetings, also holding our meetings, consistently, in locations that symbolize a very high level of aspiration in education in the United States. The first meeting, of course you know, was in the Hall of the National Academies. This meeting is in a premier university on the east coast. The third meeting will be in Boston and we will be in Boston schools and MIT as we have the events of the September meeting. Then November we'll be in California. Stanford has agreed to host us, and we're looking into also having part of that meeting hosted by one of the prominent corporate enterprises in the Silicon Valley. So we are trying to speak, not just with our conclusions and our report, but also in the locations where we are holding these panel sessions.

Let's go ahead and talk about the question of standards of evidence and methodology. I sent you all an e-mail message yesterday that kind of outlined how we'll proceed here. My part of this is not complicated. I would simply like to reiterate that
the President's Executive Order calls for us in two phrases: one is calling for us to address results of research related proven effective and evidence based mathematics instruction; and another phrase, calling on us to marshal the best available scientific evidence. Because of that I have said that I will feel the obligation to make sure that whatever we assert, or whatever facts that we place before the public in our report, have a basis in evidence.

The purpose that I think we need to address in the discussion that we'll be having here and, probably, in the follow-up and later stage, most likely Boston, we need to address really how far we want to carry the question of standards of evidence.

As I look at it, what we could do as we put our report together, there are several levels that we could insist on with regard to evidence. At the very minimum, I, as Chairman, can insist that whatever facts we cite, whatever assertions we make, have at least a citation associated with it. That's what I can do, but we all know that citations don't equate to truth. We all know that there's stronger and weaker evidence for anything. And we need to address, I think, as a panel before we start to break into task groups, what are our expectations. How far do we want to try to carry our demand for evidence as we try to
place material before the President or the Secretary of Education and before the public, and what form will that take? Is there a way for us to write down what those principles are? All of those issues are what this discussion is about.

Now, what we've done is to put together a subcommittee of standards of evidence. Valerie Reyna will chair it and the other members will be Wade Boykin and Russ Whitehurst and Camilla Benbow. That group's job will be to try to keep momentum in this discussion. It's been my experience that as a discussion takes place, eventually we need to get to the point of actually writing something down and putting that back in front of the whole panel and seeing, inadvertently if we can't get to the product of the whole panel will represent us. That's what the subcommittee’s job is about. And I think we're about ready to go. So I want to start by inviting members of that subcommittee to come in any way they would like about this subject. And with that I'll turn it over to Camilla.

MS. BENBOW: I'll just be very brief so that we'll have plenty of time in discussion. I think what our hope is, is that this panel will be viewed as being driven by the evidence, rather than being seen as simply a consensus panel where the consensus
depends on who was sitting around the table, and obviously that seems a little bit more political versus being driven by evidence. It's a little bit more of a scientific process. And we're hoping that we're going to have impact down the road, that people will see that the recommendations by this panel are all evidence-based and it's based on good, quality evidence. So, when I sent an email, or decided to draft an email, it was, as I said in my email, a sacrificial draft to get this session going to put some issues on the table in terms of how do we want to evaluate the quality of the evidence that is available out there. And I know that not everybody's going to -- we're going to have to have some discussion. In the final analysis, I'm just hoping that we'll come to some principles and general principles to guide us; and that each sub-group will, probably, have a somewhat different take on it because the tasks are different. So the content group will have a different set of standards for them than, say, for example, the instructional practices group because you're using different kinds of formulas.

But anyway, we can start up front, before we discuss any issues, with some general principles to guide us in terms of how we will look at the evidence, how will we use the evidence, and what we think is
good quality evidence versus not so good. I think that could help us down the road. We all might all have some points where we might get some disagreements, but at this point that's all I need to say. I'll turn it over to Valerie as the Chair.

DR. REYNA: Good morning everyone. This is Valerie Reyna and good morning, everyone.

I am going to mention a few ideas. They are tentative at this stage, because we really haven't had a chance, as a group, to discuss all of them, but I'd like to initiate that process and begin to talk about some concrete ideas about the quality of evidence.

And to echo what Camilla said, I know that my concern is that we base what we say on the highest quality scientific evidence, but we also have the charge of thinking about what might be promising or suggestive that might be the subject of future research, and I think the important thing is to make that distinction. The things that we know now that can be said at the highest standards of scientific evidence and things that maybe there's some evidence for, but that are a little bit weaker and need further investigation, and then there are things that are unfounded claims that we really can't say are more than opinion. And to echo what the Chair said, those
things are things that I would suggest be marked as opinions.

So just to throw out some type of suggestions reacting to some of the communications we've already had. I'm building on some of the concrete suggestions that Camilla made - (thank you very much, by the way, those were very helpful) as well as an email that Russ Whitehurst has sent and some comments by members of the panel like Russell Gersten and Sandra. So, in trying to put those together, let me give a couple of concrete suggestions.

First of all there is a concept called the hierarchy of evidence and this is a concept that is used in many guidelines ranging from Cochrane criteria used in medicine to the camel collaboration to NIH consensus documents and a variety of other kinds of evidence based summaries of evidence. And those include things such as experimental or random assignment, techniques being used to be able to refer causation. They include correlational designs as a somewhat less strong evidence of causation, but still, nevertheless, evidence and going down the line. So that's one thing I would throw out that design for our studies would be an important consideration, especially with respect to the nature of the inference
we would want to make. So, in other words, there are
different kinds of methodologies and they address
different kinds of questions and this echoes,
essentially, what the National Academy of Science had
said several years ago. And these are all important
and valuable sources of evidence, but if our question
is one for example, effectiveness of practice, then a
certain kind of methodology or design is required to
make that kind of inference. So that would be my
first consideration I'm going to throw out. There
will be other things too, for example, like adequate
sample size, and this panel has the charge of thinking
in a broad manner, generalizing to more than a few
people. So because of that, we have to think about
inference and appropriate inference and so the sample
size is a consideration. And there are things like,
and I'm not going to go into all of them, but that
dependent measures be reliable and valid and
sensitive. That if we're looking at an intervention,
that it was done sufficiently long that there's an
opportunity to observe an effect. So, for example,
even the best practice or intervention, if it is not
done long enough, will not necessarily show an effect,
so that there have to be certain basic conditions that
have to apply in order to be able to be in a position
to observe that something is affected to begin with.
Also, I think there are a number of issues that would apply, not to the randomized assignment experiment, but to what I would consider second tier evidence. So for example, we might summarize smaller scale studies that are tightly designed, but that are not multi-centered trials. They're not large scale, they haven't been done with, you know, an array of populations, and we might consider such evidence as not absolutely conclusive, but suggestive and worthy of further investigation. So, in other words, what the argument I'm making is that we, it's not that we ignore lesser forms of evidence, but that we distinguish them explicitly and make our strong recommendations based on the highest quality of evidence, and then think about being a new vistas for future research as a result of that.

DR. FAULKNER: Thank you Valerie. Wade, I might ask for your comments.

DR. BOYKIN: Well, let me say, I pretty much concur with what's already been said, and I jotted some notes down here to share a few comments, perhaps, a few complexifiers for our discussion.

I think that it is certainly the case that there are conventional principles for a good research design, a good research methodology that we should adhere to. Principles around reliability for example,
around internal validity, around external validity. With regards to reliability, we're talking about manners of replication, a replication of findings as opposed to one shot results. We're also talking about internal reliability of measures, of observations and other data gathering tools.

When we come to internal validity, we're talking about whether outcomes that we obtained actually occurred or resulted from the practice of being engaged in the treatments or the programs that had been deployed. And then with regard to external validity, we're talking about issues and generalized ability -- can other sites get the same results that we did. But beyond that, the question is, do the results in our tightly, sometimes controlled experiments, do they apply, for example, to the real world complexities of classrooms?

One caveat I throw out here to the panel to kind of stir the pot here is that we sometimes get so narrow in our quest to achieve internal validity that we sacrifice principles of external validity or generalized ability. I think that's going to come up for discussion. We just need to reach some kind of happy medium here. We should also be, I think, aware that evidence is not always absolute. It certainly can be conditionalized. So in our efforts to discern,
for example, what works or best practices, we should not lose sight of why some things work, or how things work, for whom do some things work or not work, where does it work, under what conditions does it work or not work. So, clearly, the issue of conditionalizing results is important for us to consider.

We should also worry -- this issue of evidence -- about the narrow evidence of what as well as evidence for what. In terms of the issue of evidence, we certainly should focus on, obviously, math learning, math performance, achievement outcomes in math. But there are also, well, let's say proximal outcomes, process outcomes that are likely to be precursors for math performance outcomes that we should also pay attention to, things like task engaging, persistence, efficacy, motivation, effort, attention. These are issues that are evidence that we need to pay attention to as well. And then evidence for what. Certainly, a crucial goal of our efforts is to discern ways to enhance math learning, math achievement for K-12 students, but we must be mindful of the insistent achievement gaps that exist between certain groups in our schooling populations, gaps that, simply, must be closed. To look, for example, at the 2005 math data, 47 percent of white 4th graders were at or above proficiency in math. It was only
true of the 13 percent African Americans and nine percent Hispanics. When we put that against the reality that one out of every three that will enter into the American labor force is black or brown, this becomes a sizable consideration that we cannot shy away from in our deliberations. So we must focus certainly as an important objective on raising achievement for our students in general, but also simultaneously closing achievement gaps. So sound and solid evidence you must gather to be sure, but evidence, in particular, that leads to the goals of raising achievement and simultaneously closing gaps. That must be a priority of ours.

DR. FAULKNER: Russ.

MR. WHITEHURST: Thank you, Mr. Chairman. Almost everything worth saying has already been said on this topic, but that's no reason to not say it or repeat it again. I agree with, I think, everything that's been said. There is, however, something I think we need to attend to that is, perhaps, not a nuance, and that is the instructions with regarding the President's Charge to the panel. I draw your attention to the statement that the reports that the panel issues, at a minimum, contain recommendations on and then it lists a series of topics. It doesn't give us the option of saying: well, in the absence of
strong evidence, we shall remain silent. Rather, we are required to give recommendations. So I think there's a tension between what some people that have spoken already have said with respect to we're going to use the strongest quality evidence as the basis for our recommendations, and the requirement to make recommendations in areas in which there may not be strong evidence or the evidence may be variable in terms of quality and quantity. That, I think, leads back to a point that Valerie made and that's necessity to commit to a hierarchy of evidence, at least a loose hierarchy, and be able to use and have access to and be willing to consider a wide range of evidence within that hierarchy. And I think a way of bridging the tension between the commitment to the highest quality evidence and the requirement of recommendations on each of these subjects, is to just be very clear about the quality of the evidence we're using. So this is the panel's recommendation and in some cases that recommendation will be based on high quality evidence. In some cases that recommendation will be based on lower quality evidence.

My opinion is that as long as we're faithful in labeling the quality of evidence we're carrying our job responsibly. I think that will not be easy even in established areas. By established, I
mean the areas in which there's a long tradition of using evidence for decision making and set ups of mechanisms and processes set up for vetting evidence even in those areas that are, for example, vetting the results in medical trials. There are still substantial disagreements once you lift up as to exactly what evidence should be considered under what circumstances. Certainly the terrain is more unsettled in education. And when people look at evidence in, and very systematically, it's time consuming to do that. You can take a particular topic and it's not unusual for people who are vetting the evidence on that topic, to take at least a couple of years to synthesize the evidence that generates conclusions. We don't have that sort of time frame available to us here. So, I think, we're going to struggle with how to label evidence and what represents higher quality versus medium level versus lower quality evidence, but I think we have to do that and be transparent about the decisions we make and the basis for those decisions. So we are open to corrections and feedback we're going to get from the field on how those processes are made.

I want to come back to -- to make a premise here. I think it's been unstated and implicit in what we're doing and that is that, we have a choice
between evidence-based process and one that is, instead, based on faith, hope, and high expectations. And no matter the prominence of the membership of this panel, we are all subject to the human frailties in interpreting information, and if all we are is a consensus panel trying to come together around a set of opinions we could all agree to, I think we will do far less than we otherwise might have done in advancing the agenda.

So I hope we will all commit ourselves to the struggle to identify the evidence behind our conclusions and to label it accurately. Thank you.

DR. FAULKNER: Thank you, Russ. Let me just follow up the comments that have been made by saying that I'd like to underscore the last point made by Russ that we've been asked to try to formulate an agenda, a set of recommendations based on the best of what is known. In some cases we're going to find that the best of what is known is not rock solid and we're going to have to do our best to formulate whatever recommendations we want to make from them.

I, personally, don't believe that we can escape a way of going forward where we admit and address issues where there are variable levels of confidence in what we know and what we can recommend, and that the key to addressing it is to be just
forthright about what is known about how we labeled results. But I think that each of the task groups, as we move forward, need to keep in mind that as they're addressing materials that understanding and comprehending -- a stronger word sometimes than an understanding -- that the basis of what is known is a very important part of the task group. With that, let me open this for general discussion. Let's see what you have in mind, what your reactions are to Camilla's summary, to anything that's been said here so far.

DR. FAULKNER:  Sandra.

DR. STOTSKY:  Sandra Stotsky. I would just like to raise, for discussion, the question of the relationship of evidence to the question at hand, and in order to fulfill some of the expectations for recommendations, or some of the items that we are being asked to consider, the kind of evidence that would not be related to experimental research, but would be textual or supportive for, say, social policy questions. Let me just give a couple of examples. For example, if one wanted to relate to learning processes the question of the length of the school day or the length of the school year, which we know in this country is about the shortest of any country in the world, this is an important variable in relating to learning, but in order to posit this question in
support for a longer school day, support for a longer school year in this country, we're going to have experimental evidence from this country to use and I doubt that we could ever really get good experimental evidence -- not that you couldn't get contextual or descriptive data. So the question is, for questions like that, for some of the issues that we might want to consider, are we going to be able to create rationales -- basically what you want are rationales -- to address whatever might appear as a consensus question that you've seen based on, to some extent, common sense and I've mentioned this before as something that's desirable?

DR. FAULKNER: Do you want that question answered?

DR. REYNA: I'd be happy to talk about that question. It's a really important question. You know, there are some suggestive data in this area that have to do with time on task that have been strongly replicated and, you know, appear again and again that would bear on this. They don't bear as directly as if there had been a randomized trial in which we took, you know, a population of students and randomized half of them to a longer school day and a longer school year intervention and the other half to, you know, a lesser school day -- fewer -- shorter school year
intervention. That would be the strongest form of evidence. In fact, I think it's possible that at some date in the future that we will pilot interventions like that when we have something that we think is very important, as you say it is. I agree with that. I think that it is important. So, it's not that it's impossible in principle to do a pilot study in which you randomize. However, there are other forms of evidence. There's the time on task evidence I mentioned, but also there's correlational, econometric kinds of approaches to questions such as that. You mentioned other countries. You can look at data in which this varies across countries in an attempt to control for a variety of differences that exist as we know across the country and look at a kind of quasi-experimental analysis of how a school day affects achievement. So I think that's actually a good example of a question that's acceptable to analysis and evidence.

DR. SIEGLER: Could I make some comments?

DR. FAULKNER: Yes, please.

DR. SIEGLER: Sorry I can't be with you.

DR. FAULKNER: Is this Bob Siegler?

DR. SIEGLER: Yes, it is.

DR. FAULKNER: Okay, Bob, go ahead.

DR. SIEGLER: The question that I'd like
to ask has to do with the scope of the panel's mission. There are a whole bunch of questions, of which the one that Sandra raised is one, that are relevant to math, but are relevant to policies regarding education more broadly, so teacher pay is another one. If we pay teachers twice as much or make their pay contingent on student achievement, we might be able to improve education in general. Now, these questions aren't about math in particular, they're about broader social policies, and the question is, should we be considering these broader social policy issues or should we focus, exclusively, on the issues directly relevant to math and not necessarily to other aspects of education?

DR. FAULKNER: As chair, let me comment -- Camilla might want to add comments, too -- but, I think, we have to attend to our charge first. Our charge is about math and it may be that we will conclude that one or more of these broader, social policy questions is important for us to bring up and to make a recommendation on in the course of this report, but I'd like for us not to spend most of our time dealing with things that are global so that we never get to the particulars that we were constituted to address. So I'd like to stay close to the particulars. With respect to Sandra's comments -- or
question -- let me just say that, I think, we could, if we wanted to, make a recommendation of the type that you've suggested, Sandra, but, I think, we would also have to say -- it would be our obligation to say -- that this rests largely on instinct or common sense, or whatever else we can marshal that relates to it, that it's not grounded in -- you know, in experimental results. Russell.

DR. GERSTEN: I'd just like to ground some of the -- I mean, Sandra raised some very important points, but I think what Russ said and Wade and Valerie talked about at the beginning is excellent. It's very thoughtful, it reminds us all of mechanics of social science research, but what we're faced with is two things and as we chat on the bus or over coffee -- you know, before the session -- is, number one, there is a -- there is, definitely, some interesting and important case study research, some interesting, descriptive research, some high quality work on the nature of math disabilities, but there is not a lot for us to draw on that to any of these upper tiers, which, you know, what Russ Whitehurst shared with us -- this B to A level. And where we run into problems and what each of us is grappling with, I think, in our own head is when we start to get into these weaker levels, expert opinion, looking at descriptive
studies, what inferences can we draw from international comparisons or from comparison of different states, because there are so many other explanations that are there. And that, to me, is the frightening part of our charge. When do you just get overwhelmed and say, okay, common sense tells us that, you know, based on this descriptive data, we can say that the curriculum used in these two countries is better for us, or that it's more important that math teachers know more math than our average American teachers. That is -- we have so many gray areas to deal with and I think very little to guide us with. So that is, I think, something we're all going to have to grapple with and be candid with, because at some point if we say, although the evidence as we infer such as the curriculum is the most important thing. We have to make our thinking explicit at least, or just say we are -- there are just two views on why this happens, because that is a lot of where our work's going to be. I also -- after Deborah's speech, a very important part of our conversation, I think it fits our charge for the first hour about maybe giving some coherence and some -- some way for us to think about our charge and the kind of overwhelming nature of the recommendations we have to make.

DR. FAULKNER: Deborah.
DR. BALL: I want to comment on the last several comments we've made and link them to the earlier remarks. The history of research in our field, over the last several decades, has been one of the subject matter that we think is probably one of the variables. So, for example, the time on task literature didn't consider adequately the differences across content areas and generalizations were held to be true about what seems to be common sense about the amount of time kids spend learning, relates to their achievement. That's common sense, but the ways in which that may differ across subjects or for a particular construction in subjects, particular goals, particular treatments hasn't been studied. So if one of the things given our charge to ourselves to be careful, is that as we move forward, we're going to have to take a common effect. We are, as you said, and we know about mathematics and the evidence often will lead us to -- we need to be cautious to understand that claims that people walk around claiming to be based on evidence, actually come out of a period of research in which subject matter was almost vacant. It, basically, didn't appear in the educational research literature. It's only really in the last -- I would say -- depending on which of our subjects we're talking about, it's only in the last
couple of decades that there's begun to be a serious
treatment about the differences across disciplines and
that really begins to lay out the problem, because
within that we know that there are differences of
goals, differences of treatment, so, for example,
conclusions that could be drawn about mathematics
instruction one have to examine what the goals of that
instruction and the methods of that were. So when
you're talking about what are sometimes called higher
order learning goals, that might not be generalizable
from studies that. So I just want us to be very
careful.

And the main headline of my comment is
that generalized ability in our field is treacherous
given that often subject matter didn't figure in. And
a minor second point that I'd like to make is on the
international comparisons. We're vulnerable to
something that I haven't heard any of the first few
speakers comment on, which is, the time to draw
conclusions where many of the variables that most
people who have thought carefully about these issues
are simply not measured. So, for example,
international comparisons of instruction is almost
never studied at all -- never measured, never studied.
Conclusions, therefore, drawn by international
comparisons that don't know differences in instruction
are only dealing with extremely weak measures of
instructions, such as teachers' reports about what
they do on a once a year basis, simply can't count, in
my view, for adequate or valid measures of
instruction. So here I want us to notice that when we
examine conclusions that we look inside of these
studies to consider what was measured and what that
means for the degree to which the models were actually
specified for finding the conclusions.

DR. FAULKNER: Wu.

DR. WU: What I want to say reinforces a
part of what Deborah just said a moment ago, it's good
that you ask for evidence, but we're talking about -
not evidence of sociology, sociological research in
general, but evidence for mathematics education. I
think this problem has not been properly recognized.
One clear-cut example is how students learn fractions.
The research on that as what works, what doesn't
work, why students don't learn, why students do learn
-- all that -- I think, most of it would be
fundamentally flawed for the simple reason that, from
my knowledge, except for a very brief period when
people make experiments, the last several decades
they're teaching the fractions is fundamentally
flawed. I don't want to go into details about that,
but that's mathematically flawed. This is a judgment
based upon professional expertise and I don't know if that figures into research. So, flawed teaching, which often includes conclusions of what works and what doesn't work, why people learn, why people don't learn and then ask. When asked what is that based on they say we will teach it that way. Do people learn or do people don't learn on the basis of flawed teaching. Is that in terms of mathematics education? It's something. It's not one of the easiest examples to convey, but I think as we go on discussing various things, especially in our small task groups, I think, mathematics education would have to be taken into account.

DR. FAULKNER: Thank you. Yes, Wilfried.

DR. SCHMID: Something that has not been mentioned this morning, although in some of the changes has been mentioned that, of course, that there will be questions that we cannot resolve by scientific evidence. For example, what is and what isn't algebra, what is advanced mathematics, what are the skills that are necessary to succeed in those. There's a lot of disagreement, I think, but nonetheless, I think, we will not be able to fulfill our charge unless we speak to those issues. Let me just say, hypothetically, some might say why teach fractions so we can define some of these difficulties
of existence, but that's, obviously, not a solution. I mean, we need to spell out what are the critical skills that cannot be based on scientific evidence.

DR. FAULKNER: There will be some things that are measured in definition, of course. Matters of definition don't require evidence. Yes. Okay. Skip.

DR. FENNELL: Yes. Skip Fennell. I'd like to sort of disagree with Wu in one sense in that it depends on how one looks at research. There has been a fair amount of research from what was then called the Rational Numbers Project that looked at fractions. One might not agree with that work, -but it is a body of work and, I think, we look at that as we make recommendations. I would agree with Wilfried that there will be issues that we will encounter -- and then I'll go back to Russell's statement, which really summarized it as for me -- when we make recommendations. Our charge is to identify the evidence and label it accurately; and if we do that, there will be times when we reach the highest level as suggested by Valerie earlier and other times when what we'll be looking at are things that we might recommend and/or things that are literature.

DR. FAULKNER: Diane.

MS. JONES: I think really I just wanted
to remind everybody that the Executive Order does have some flexibility; that it is okay if one of the recommendations is that the research doesn't show conclusively, the recommendation is that a body of research needs to be commissioned, developed, encouraged in this area. Now, we wouldn't want a report for everything to simply say we need to do more research, but it is, you know, when we wrote the Executive Order, we did consider that there will be areas for which there is not enough evidence to actually make a constructive recommendation other than -- needs considerable additional study. So, I think, we do need to make some recommendations, but we do also have a flexibility to encourage additional research in a particular area.

DR. FAULKNER: Thank you, Diane. I think that it's highly likely that this whole project is going to emerge with a list of things that need to be followed up. Sandra.

DR. STOTSKY: I was going to elaborate on that just a little bit. I agree with that. I certainly agree with that we have to be cautious in looking at any of the older bodies of research for their omissions and deficiencies, but, I think, it would be extremely valuable for us to be looking at them and to be noting their deficiencies in order to
point out what it is we need to recommend for research in these areas. Time on task is one. I'm thinking of a particular study that came out, maybe, about twenty years ago by the U.S. Department of Ed that looked at several countries in great detail; whether it looked at subject areas, specifically, I don't recall. I have to look at the study again, which I have at home. I did not bring it with me; but the point was, there was careful examination of differences between the amount of time devoted to instruction in these countries and the time for recess, and the time for socialization in passing between subject areas. The point was, some of this was very high level, meaning it wasn't specific to a subject and one might be able to, at least, generalize at a lower level that they are.—There are some important variables here that are being tapped; and, therefore, here is what we need to hone in on for specific research on math and science. There may be some quality studies in their day that simply need to be critiqued. I'm thinking of areas, particularly, in relation to teacher licensure and so forth. Here we have some very serious omissions that, nevertheless, the studies looking at some aspect of it have interesting areas to suggest to us. How we define and carefully lay out what we see as the omissions in these studies, in other words,
under critical examinations of some of these literatures. I think that may be one of the most useful parts of what we do.

DR. FAULKNER: Deborah.

DR. BALL: If I could just make a brief comment about that --

DR. FAULKNER: Turn your thing up.

DR. BALL: (equipment failure -- break in transcription) I've actually been very interested in research on time and have completed a rather large study about time in instruction and achievement so I'm familiar with many of these studies. I just want to underscore again that one of the things that we didn't talk about yet very much, and is complicated, is the question of specification of the models. So whenever you try to draw relationships of some kind, you've got to be sure that the things that you put in the model measure validly with things that you think could be associated. So we could have very high quality, which is part of the problem with time literature -- I'm using this just as an illustration -- but there are different ways time is used. To draw a conclusion that related student achievement requires you to have (equipment failure -- break in transcription) carefully to other things that could impact differences, variations in student achievement and
(equipment failure -- break in transcription) that study envision those. That's the problem that we're going to run into that (equipment failure -- break in transcription) expertise (equipment failure -- break in transcription) and that may mean that we can talk about them in a way that several have said by saying here's the kind of evidence that is and here's what's missing. I just want to be careful and standard about specifying (equipment failure -- break in transcription) being careful (equipment failure -- break in transcription) variable (equipment failure -- break in transcription) takes too much technical language (equipment failure -- break in transcription) that the variables have played that any (equipment failure -- break in transcription) any of us, actually, might hypothesize are actually (equipment failure -- break in transcription) because we have these data and we thought they were associated with achievement (equipment failure -- break in transcription) that allows us to conclude that. I just want to underscore that, because that's one of the biggest problems we run into in our research; so many things having (equipment failure -- break in transcription) measured (equipment failure -- break in transcription) I just think that's going to be a cautionary (equipment failure -- break in transcription)
transcription) but the solution that Russ (equipment failure -- break in transcription) proposed that we be able to transparently say the nature of the evidence does permit us to venture into territories. I just want to be careful about how causally (equipment failure -- break in transcription) or strongly we think the evidence allows us to make (equipment failure -- break in transcription) claims.

DR. FAULKNER: Russell.

DR. GERSTEN: Just a follow up. Deborah's point, one advantage of going back to primary sources is -- for example, the time on task. The people who put the research together (equipment failure -- break in transcription) and Gage and (equipment failure -- break in transcription) and others, cut across reading and math and this was their insight. When we, actually, look at the studies, there are specific studies of math instruction only with their warts and all on the work that followed through Tom Good's work. By going back to the primary sources, I think, we can better achieve Deborah's charge here.

DR. FAULKNER: You've brought it to a natural end for ten o'clock. Okay, I think what I've heard -- what we've all heard a lot of things today, but the beginning point is that we didn't hear a rebellion against Camilla's summary, so I think that's
a starting point. But we are going to have, I think, to elaborate what we've heard here into a document. The sub-committee will do that before we meet again. You'll have a chance to study it and maybe even react to it by e-mail a bit before we get together. I'm hearing us beginning to converge. Russell made an interesting comment. He referred to how frightening our charge is. I'd like to just bring it to the attention of this panel how frightening the role is for a public officer who is charged with marshaling the nation's resources in some direction toward the education of our young people. Everyone of those public officers, in those questions of public policy, as well as all other questions of public policy, always have to work with an imperfect background of knowledge. The picture is never complete. In fact, it's often extremely fragmented, as we are going to find this one to be. And finding the best path -- or recommending the best path -- through that, is going to involve matters of judgment that we are charged with. Providing advice we aren't charged with making final decisions. The people who receive our work are charged with making the final decision. We need to do the best work we can. That means that we owe it to them to evaluate the evidence and be forthright about what is -- as well as we can judge -- what is our
opinion about the things that work. As the task
groups begin with their work, I hope they'll keep that
in mind. I know that there are ranges of methods that
are used to cross the areas of the task groups
representing; and what types of data or types of
results can be found varies quite a lot. We just have
to remember. I think we are leaning toward an
agreement that we will be forthright in what we label
things and how we label things initially. Let me
mention a couple other things; one is that we are
working on a contract to get some help in filtering
the literature for the task groups. Some of us have
already been involved in looking at that contract and
taking a look at its provisions and so forth. The
task group chairs all need to look at it, but we think
you should look at it after you have your first
meeting of the task groups and see where we go. What
we want to do is produce a contract that is going to
get us the results that we need. I think that we want
to be sure that the task groups' chairs -- contracts
-- and that will be looked at a little bit later.
Tyrrell will see that they get to each of the chairs.
The contract provisions, statement of work, actually,
calls for this to be done in August and that's pretty
quick execution, but the idea is to get -- to be able
to put the literature in a filtered way -- filtered by
your principles and in front of you in time for the
Boston meeting. With that, I think we're about ready
to break up. Let me open the floor just a moment for
any questions about where we go next.

DR. BALL: Could you say two or three more
sentences about what you were just talking about
filtering literature. I don't think I understood that
very well and it sounds important.

DR. FAULKNER: It's literature search.

DR. BALL: What do you mean a contract and
what do you mean by filtering?

DR. FAULKNER: We're going to hire people
to do literature searches. They will have to do it on
some basis that you will have to find.

DR. BALL: That's very good. I'm glad to
hear it.

DR. GERSTEN: Is it more search than
filter? I think the word filter was a concern. It's
what they'll search through.

DR. FAULKNER: I assume you'll take out the
organic chemistry?

DR. GERSTEN: The politics of filtering.

DR. FAULKNER: Yes, Dr. Wu.

DR. WU: I think I should put on the
record that the (equipment failure -- break in
transcription) literature (equipment failure -- break
in transcription) NRC panel looking at the teacher preparation, which is identical to what (equipment failure -- break in transcription) they are in the process of looking for what we call (equipment failure -- break in transcription) literature. For example, (equipment failure -- break in transcription) the same thing. Obviously (equipment failure -- break in transcription) this is a good idea (equipment failure -- break in transcription).

DR. FAULKNER: Valerie.

DR. REYNA: Just on the word filtering, let me add. One of the reasons, I think, it is important for us to discuss these criteria up front, is to make them explicit and transparent so that anyone who applies these criteria would come up with the same set of resources for us.

DR. FAULKNER: Thank you. Okay, I think we're ready to break into task groups. The four task groups are going to be meeting upstairs and so this will conclude the open session and the task groups will be meeting and we'll come back in open session this afternoon in order to report on the progress of those task groups. Again, thank you for being here at this open meeting and we look forward to seeing to seeing you all this afternoon.

(Session I concluded at 10:01 a.m.)
DR. FAULKNER: I call this panel back into open session. There are a couple of things that I'd like to say before we go on into our main purpose here. First of all, let me welcome the guests around the room to the open session here and remind everyone that we have a time tomorrow for public comment in the afternoon. I don't know if we have space left or not. Session 2 started at 3:01 p.m. Space may be left for comment tomorrow, but you need to sign up. See Jennifer Graban, over there -- stand up. Okay, and Tyrrell tells me there will be room for walk in comment, if we have time, tomorrow. Second, the question has been raised about Congressional developments on the Math Now initiative -- as to whether they have changed our timetable to any degree and we've gotten word back from Tom Luce on that. His comment was, while the discussions are going on with Congress, there is no resolution. That the debate -- in his mind anyway -- is whether it would be funded in this cycle or the next cycle and that our timetable is unaffected. That is, we still owe a report -- an interim report by January 31st and a final report by February 28, 2008. There was one other thing and that is that we have a signer here. I want to ask in the audience if there are folks who need that service. If not, we will discontinue it. If we do need the
service we will be glad to continue it. So is there anyone who requires signing services? Seeing no call for that, we'll discontinue it, thank you. Okay, we're convened in this open session mainly to allow the four task groups, who have been convened separately for the last several hours, to come back together to talk about what they've been about and to allow for more information across the task groups allowing the whole panel to hear what each group is doing. I want to begin by going through the Chairs and ask each Chair to make a report of what you're -- what you've done, where you're headed, what you think your agenda is, what you think you need to get done, issues that you may believe have an intersection with other task groups. - Just any form of communication that gives this panel an idea of where you're headed and gives the other task groups a chance to see if there are points of intersection. I'll start with Skip Fennell who is running task group one, conceptual knowledge and skills.

DR. FENNELL: Thanks Larry. My task force included Wilfried Schmid, Liping Ma, Larry and myself. Our goal would be to suggest critical concepts and skills, which would lead to algebra. We would see this as a fairly tight list of important mathematics concepts of ideas that would then underneath that have
a pretty deep description of the ideas that would support such mathematical knowledge. We would also get to the point, in addition to sort of defining those outlets leading toward algebra, we will take a crack at defining algebra. That definition will probably not be as deep in terms of all of the major aspects of algebra. It may at some point be sliced, as we might conveniently slice algebra into -- as we often do in this country -- one and two; but for the moment that's a description, a definition of algebra. Relative to the sort of cross ideas where we would need support - or burning issues for consideration - so to the group on instructional practices we would probably lobby in direction the issue of the role of the calculator in instruction. I'm told that you probably talked about that a bit or whatever. To the group that is working in the area of learning, we would ask consideration for, as we would frame sort of grade level descriptions of topics, notions about the learning of those topics at particular levels of development. To the teacher background, teacher group - not so much the need to connect with what you're doing, but the awareness that, as we more and more think about algebra as an initial course in mathematics that tends to occur at the middle school level, the preparation of teachers at that level in
terms of their own mathematical knowledge and background. The concern that is -- that actually reported -- in this country, but again as more and more kids encounter this course even earlier than grade 8, the mathematical background of those who teach it is important.

DR. FAULKNER: Okay, that, I think, is a summary of where we're going -- went through its agenda. Do you want to comment a little bit on the kinds of information that we're going to be looking through, Skip, and then I want to invite anyone to ask questions.

DR. FENNELL: We've actually done some of that. We're looking at information from the Curriculum Center Project supported by the National Science Foundation located cooperatively at the University of Missouri, Michigan State University, and Western Michigan University where they utilize learning expectations across state curriculum. We're looking at -- actually, we have several reports from that project that we have right now and will examine more deeply. We're looking at the document that is currently published by the Mathematical Association, the Common Ground Document, that actually Wilfried and Deborah were involved with; and we're also going to have access to the 19 states that have course level
expectations for high school mathematics -- that is Algebra I expectations and so forth -- to see what commonality there is across other states, particularly in Algebra I. We will also be looking at curricula from other cultures, particularly Asian cultures, with regards to not only Pre-K through 8 but also high school mathematics. We are also looking at -- we're going to look at a draft of the Curriculum Focal Points that are a series of three major focus topics of instruction, Pre-K through 8 -- published by the National Council of Teachers of Mathematics. If I'm forgetting something --

    DR. FAULKNER: I just wanted them to get the general idea.

    DR. LOVELESS: Just a question. Will you be looking at any historical documents to see how K-8 curriculum has been defined in the past or how algebra has been defined in the past?

    DR. FENNELL: That's a great question and in all candor we certainly should. So I'll certainly take another look.

    DR. SCHMID: (equipment failure -- break in transcription)

    DR. FENNELL: Yes, sir. We do have Vern's book.

    DR. FAULKNER: Tyrrell's asked me if you
would not mind identifying yourselves -- That was an 
exchange between Wilfried Schmid and Skip.

DR. FENNELL: This is Skip Fennell. We 
have had many exchanges across the couple of hours.

DR. FAULKNER: Any other questions or 
comments regarding Group One? Okay, let's go to Group 
Two. Group Two is learning processes and Dave Geary 
is the Chair.

DR. GEARY: All right. Thank you. Group 
Two was Valerie, Wade, myself, and then Dan Berch and Bob 
Siegler through the teleconferencing. I'll give you an 
outline of what we discussed and how we're going to 
proceed from here. Of course we want to make links with 
the other groups, but we also thought it was important to 
try to link some the experimental work to some of the 
national surveys. So we're thinking an initial step might 
be to begin looking at some of the large-scale studies 
made these and others. Looking, asking the pertinent data 
of the folks in the factor analyses and other analyses. 
Other types of things to look at how these items are 
clustering together. What is predicting long-term 
learning in particular areas? By clustering these items 
together we may be able to forge links with the 
experimental stuff. With the experimental literature, 
I'll just read you some of our basic criteria -- will be 
English language, empirical studies, three years of age to
college, peer review journals that will discriminate experimental studies, project experimental studies, correlational studies. We have three to four phases of how we are thinking we will proceed with the literature review in the content areas that we'll focus on and I'll spare you those details. We will include in the review all articles that are explicitly addressing diversity issues; and those include race, ethnicity, sex, gender, social economic status, learning disabilities, giftedness, and social cultural backgrounds. So we'll have somewhat different criteria for that. Content domains will range from Pre-K to algebra and these will be modified with the first group seeing which areas are of more critical importance than others. Within each of these areas, we're going to try to get an understanding of children's conceptual understanding domain, procedural skills associated with it, skill acquisition in both of these domains as well as the declarative knowledge – that may be knowing facts, numbers, whatever the case might be, that might contribute to the ability to solve problems in that area and to move on and to learn. We're going to do reviews of Pre-K, kindergarten, and spatial mathematics relationships. We may look at elementary arithmetic, operations, base 10, fractions, so forth, word problems, algebraic procedures and concepts and will need the first group's input, specifically, the types of things we may
look at. Pre-algebra, we weren't sure whether to put this in arithmetic or -- things like exponents, radicals, sets, so forth -- Other areas are probability judgments, measurements, ratios, and so forth. We were also hoping to maybe tie all the areas together or, at least, provide a tutorial towards the end, or at the beginning, wherever it fits best, on some general principles of learning. The importance of -- how working memory's involved in problem solving, mechanisms of learning transfer and so forth. So there are many of these things that are common -- although the ways in which they are -- both provide both general principles as well as examples within the specific content areas and that's by September.

DR. FAULKNER: Other comments on panel two. Skip.

DR. FENNELL: Skip Fennell. Following that -- as you indicated a couple times, the closer we get to the kind of framing of the mathematics to the levels that -- back and forth between your works, best judgment about the readiness and ability for kids to learn particular things at certain levels and in our best judgment as to what mathematics might be of more interest than other mathematics.

DR. GEARY: Right.

DR. FENNELL: For instance, we had a discussion sort of arguing against calling anything pre-
algebra and that we would work toward the essential mathematics that would lead to algebra; and in that would be probably things that were historically, or some people label as pre-algebra, we were careful about not wanting to do such labeling.

DR. GEARY: Okay.

DR. FENNELL: Just as one for instance.

DR. GEARY: Right, right. So that's the type of information we'll be framing our review.

DR. FAULKNER: Tom.

DR. LOVELESS: The role of practice and memorization, would that be under the topic of how to achieve or not?

DR. GEARY: That would be part of the topic of automaticity -- and certainly that's how we would view automaticity as a general principle, but also if we're looking at fluency, say, in solving a multi-column arithmetic problem or the fluency in simple arithmetic is predictive of that. We're trying to be as precise as the literature allows us.

DR. FAULKNER: Anyone else? I want you to know that I'm a richer man today having learned the word automaticity. All right, let's go to task group three, that's Russell Gersten, instructional practices issues.

DR. GERSTEN: I definitely missed the discussion in Valerie's group about -- thought about that
for 35 years. Interpret coordination with other groups. We think it's important with all, but in terms of our charge, which is curriculum and practice that according to Skip's group is essential, because curriculum and what you want the students to learn are obviously the linkage so we need to always be in touch there. We also thought that the criteria that Russ shared this morning are reasonable for us to use as we go through whatever we go through. I'd say probably, given advancements of both curriculum practice, it'd be better to say we surveyed the landscape than developed a clear and firm plan, which isn't bad for a half a day, and we do have some issues that we thought we'd throw out in terms of the whole group towards the end. One document for the curriculum that we'd definitely start with would be the recent, National Research Council book on evaluating curriculum, because it's very germane. It's a bit of a bleak read in that it says there's basically no evidence to support the use of any curriculum, but it certainly raises issues and we'll consider that a key part of what we do. Another thing, and we may need to work things out a little bit with Russ' group, the clearing house is currently reviewing studies in both elementary and middle school math curriculum, which would be relevant to our charge and it's a part that we can share resources there. There may also be studies, maybe not of the A, A- level, that would be appropriate
for us to look at rather than spending another 15 months
starting from scratch and going through old studies and
curriculum. Another source we, I think, we agreed to use
is the meta analysis I've been working on for five years
on instructional methods for students with LD in term --
in a couple of ways -- one is a possible framework for
looking at instruction in general; including areas that
are left out by the basically special education research.
The other thing we'd like to do with it, which my team
has not done, is use some of the criteria that Deborah and
Wu mentioned this morning; looking a little more at the
study in terms of some of the details that are relevant.
We could look for trends and effect sizes, but looking
back at the context kind of issues. The other point that
Wu made which seems so important is to separate getting
kids to function with whole numbers as sort of basic
arithmetic towards seeing if there's any evidence of how
we can teach kids, especially kids who are struggling, to
deal with rational numbers, proportion, fractions, et
cetera, which in Wu's phrase, is when real mathematics
kicks in. I mean it can be introduced before, so we will
look -- you know, look at that research that way. We'd
use books, such as _Adding It Up_ and _Learning and
Understanding_ as frameworks to help guide what we do.
Other things that we thought we should look at were -
well, we thought we should look at, I'm not sure if we
were all enthusiastic about them -- was the evaluation of
the systematic SSI -- State Initiatives. That in a sense
is -- Yeah, yeah, yeah and the BPI studies that the press
has been quite interested in, in different states, have
been interested in the promising practices analysis. So
we will look at those and see if there is anything
accessible; and this is where the resource issue comes up
on effectiveness of tutoring programs that might help
inform the department in terms of No Child Left Behind.
Are there any options that there's some evidence to
support them. The practice area is a little tougher. We
do have the meta analysis, we also have various meta
analogies where we look at the whole population, looking
at accelerations, skipping, looking at whatever research
there is on grouping and peer assistant learning
strategies which seem useful. Some of the other practices
there -- I don't want to go through and read the laundry
lists, but some of the issues we want to at least explore
is, is there evidence and what does it really mean to talk
about something like real world problems. The idea of
what we know about practices that facilitate automaticity
and retrieval of facts would also be useful. We have a
whole long laundry list -- I mean, it's not a lot of
things, but the issue becomes whether we can and should
ask the contractor to go through -- because in curriculum
we have the resources -- but in practice whether we should
ask the contractor to go through and scour since 1985 all potential studies - experimental, quasi-experimental -- that deal with aspects of practice. Is that a feasible task? Is that only feasible for the 18 months? I mean that's an issue I wonder if others are also dealing with that. It just could become a huge amount of work and when I've done these with the Clearinghouse and on my own it just -- two years go by like nothing to just access the material and weed through things that are of little value. We have some sources we can use to get us started but there are some holes. The other hole is what to do about qualitative studies. We again, there are hundreds and hundreds and one thing we can do is those that are frequently cited or that other panels bring to our attention, to look at those; but we're in a little bit a quandary in terms of what to do with this literature or should we rely only on secondary sources. The last bear of an issue is the TIMSS. We have there three parts that are relevant just the comparisons across nations with all the problems of why the inferences, if any, can we draw from those. The second is the video analysis. We really want to seriously look at that and the work that's been done on that and see what the implications are for practice. The third would be the more prosaic - but the summaries in the TIMSS of practice recorded different schools and see if there's anything we can glean out of
that, which is much going to inform later research. So there is a sense where terrain is very, very vast. We've made some strides towards pulling out future directions, but the idea of how we productively we use the contractor to seek resources and how to set limits to this that expand us beyond what we knew five years ago; but also don't get us going out around in so many directions that we make no discernible progress is still something I think we need to continue to grapple with. I don't feel any of us feel at peace with that as of right this afternoon.

DR. FAULKNER: Wilfried.

DR. SCHMID: Two questions about instructional practice are calculator use and tracking your decimals.

DR. GERSTEN: Yes, they both are. Calculator use is definitely there and we will do some things about ability grouping and fractions.

DR. FAULKNER: Other questions or comments? Wade.

DR. BOYKIN: To what extent did your group consider this across the line from practice into the actual learning processes that go inside classrooms?

DR. GERSTEN: I see --

DR. BOYKIN: -- impact upon, in terms of learning processes and outcomes in kids in the classrooms.

DR. GERSTEN: That's something, I see -- I
see the two as there being an integral relationship between the two. We didn't explicitly discuss that, but it was implicit in much of our discussion here today. That's a good thing to bring to our attention.

DR. BOYKIN: Well, certainly that's going to be a convergence between our panel and yours.

DR. GERSTEN: Yeah, yeah.

DR. FAULKNER: Skip.

DR. FENNELL: I can almost argue, Wade, that it's really convergence certainly of three groups (equipment failure -- break in transcription) here's the mathematics, how's that impacted by learning and how is that mathematics to be taught (equipment failure -- break in transcription) background of the teacher (equipment failure -- break in transcription) So there may be an opportunity. I'm not sure how to pull this off (equipment failure -- break in transcription) simultaneously. (equipment failure -- break in transcription) Certainly not the (equipment failure -- break in transcription) process.

DR. GERSTEN: What's that?

DR. FENNELL: Certainly not for this process.

DR. GERSTEN: No, no. I think the idea -- and that's one thing I think we have to grapple as a whole panel with -- is how to have coordination that is
productive; because, I think, we've all teamed up in cases where you spend more time finding out what others haven't accomplished and you can't get your own work done, but the linkages are critical. One thing that is also, I think, critical to us -- and it would be great if we can move that way even it takes through the September meeting is that insofar as there can be some coherence to what we present. My sense is the National Reading Panel -- the fact there was a coherent organization to the material, increased its ability to be disseminated by a huge factor. I'm sure it was a lot of work to get to that point and I think any advances we connect there would be excellent so that there's some synergy, and we help people think through that. And that could be an incredibly important contribution.

DR. FAULKNER: Relative to the comment you just made, Russell, I think we talked, in effect, in our task group, which was number one, about our strategy and the number of topics that we want to deal with. I think that your group is particularly challenged by having so many sectors and so many elements to examine. We did, I think, have a consensus that we were going to try to focus on a small number of very important messages; and I'd urge people across this group, or this panel, to do the same thing. That means that you may end up having to leave some things, but you're not dissipating. Make those
choices as to what would be your most important message, but that could be a more difficult and more important problem for your task group than -- Russell is about to speak.

DR. GERSTEN: I just had a quick - you know, I think that's some good guidance to us. I'm definitely that school, but I think within the panel there will be great different perspectives and all and some topics are down indifference to me and high interest to others and trying to balance that is a real challenge given curriculum and practice.

DR. FAULKNER: I just - the likelihood of our having an impact, I think is increased if we could focus on what we're recommending very strongly. Wilfried and then Sandra.

DR. SCHMID: Of course I fully agree that we have to limit ourselves to a small number of crucial topics, but some how it's a choice of what -- what those topics are must be made by the panel as a whole. Consider how much of that decision should not be made just by Russ' group.

DR. GERSTEN: I think we'd be okay with it. We have to discuss that internally. I wonder why -- Larry, what your sense is and Larry if you want --

DR. FAULKNER: I think right now it's too early to talk about that. I think all I'd really like to
do is just sort of highlight to the panel as a whole that
-- if we can, I'd like for us to have a small number of
recommendations. It's probably too early to decide what
those are and how we're going to actually get there, but,
I think, if we look at this tremendous range of stuff,
keeping that idea in mind -- Sandra.

DR. STOTSKY: I may have missed some of the
things you mentioned. I just wonder whether you were
going to be looking at the research base for the emphasis
on what are called real world or practical activities as
part of the mathematics class, however you would define
it. I'm just sort of tossing out some buzz words now, but
this is a well used and important buzz word that's one.
Use of manipulatives, I'm not sure if you mentioned, but
perhaps you could think about whether your panel's going
to look at the research base and how that differentiates
among the different groups of learners; and then, finally,
a topic that's only recently been drawn to my attention,
because of its impact on both special education as well as
ESL students; and that is the emphasis on reading and
writing activities, per se, as part of your mathematics
class, and this relates to both standards and assessments.
There has been a contrast to earlier ways of teaching
particular mathematics. Current ways of teaching
emphasize a lot of reading and writing activities and the
question is, is there any — it's just my hypothesis to
explore - any necessary trade off with time spent on symbolic activities in math. Are there penalties for those students who have problems in reading and writing, which are certainly ESL students if we're talking about the English class, as well as the SPED student. So I'm just wondering whether these are going to be, in some way, considered, explored, or, at least, raised as questions for further research?

DR. GERSTEN: Okay. How about if I answer it, then Deborah can go on to the next one. The first one, real world problems and what they mean, I had mentioned this one as the topics. The manipulatives, it's on our list. I didn't want to bore people with the whole list.

DR. LOVELESS: I think they're going to ask about each one of the items eventually.

DR. GERSTEN: Yeah, so manipulatives is there. It's a topic of no particular interest of mine, but it's something that's there if we have to narrow. And then the third one is your question about -- that was on our list. Yeah, the language issue about expressing ideas is definitely -- basically expressing ideas in terms of mathematics. It's definitely on our list. Yeah, I just didn't mention all of them. So the answer is yes, yes, and yes.

DR. LOVELESS: I think you should read the
Yeah, because I think otherwise it's possible for every member of the group to say is this on the list.

DR. BALL: I think your voice is going to get filtered by the research base. I wanted to ask you a question and that is, how you're thinking of sorting out when something is instruction and when something is a goal. So take Sandra's example about reading and writing in the context of symbolic activity. Depending on how you would want and one thinks of what the goals are of what it means to be confident -- writing explanations might be considered part of the goal -- I'm curious how you are sorting that out is my first question. The long list of things you did read us, it reminds, again, of my question from this morning, because I know from that research base we know it doesn't probe subject matter or extend to subject matter and I wondered - really my question here just is, how far do we go in worrying about the sort of extent of the evidentiary basis. So the first has to do with the conflation of goals and means in mathematics, because some things that some people hold to be means are actually goals. That is, mathematical practices of all kinds seem to be instruction, but they may, in fact, be the goal. In mathematics this might be instruction; t may be a goal. Second is how have you -- how far do you get
DR. GERSTEN: I’ll answer. I'll start with the second question, which is how much did our group worry about the limits of the evidence base and probably in two ways. Just simply, there may not be much information there. My fear is to come up with a report - well, there's not much information on this and this and this. It's not going to be particularly compelling or useful. So I worry a lot about it. I think there's - we allow people to raise topics regardless of whether my prediction - or our prediction is there will be evidence of that quality there, at least for now. I think at some point that process does need to stop, as you say, the nature of the evidence will influence it. In terms of making generalizations like saying such and such a practice is not good based on a 1981 study on whatever cooperative groups or having kids write explanations. I would be extremely cautious about that. My sense is we're going to need to be extremely cautious about most everything we say; and in the area of practice I think we have to err on the cautious side. I use the example with the group, what I won't allow - and I don't think any of us want to allow - is what I won't mention this particular report, it basically trashed all the studies - there are two reports. They said these studies are not - these are the limits of
them and then when you got to summary and conclusions, they said, therefore, these two things benefit kids. I will not do that -- I mean, I will not do that -- we will not do that. So the limits of these and the limits of what we're going to find in studies are definitely something we worry about and makes the task pretty awesome.

DR. FAULKNER: Any further comment on the awesome task?

DR. LOVELESS: Just upon the issue of conflating the means and the ends, I think that's a very good point, but it also comes back to the intersection of our group, with the skills and knowledge group; and the fact that all of us at some point are going to have to wrestle with the question of what do we mean by mathematics. If we decide that reading and writing about algebra constitutes a critical component of what it means to be proficient in algebra, that will lead us in another direction.

DR. FAULKNER: Okay, let's go to Deborah who has the fourth task group on teachers.

DR. BALL: If group three has an awesome task, I really don't know what adjective to use for ours, because ours is the last one so it seems to catch everything that hasn't already shown somewhere else. So we spend our time working on a task that helped us to
answer the question, what should be the scope of the sub-
group's task and what would be our basis of deciding to
restrict or specify it as we propose to do and had a
chance to feedback to all or you so you could comment.
The two questions we were trying to figure out is, what
are the domains of this group that says sort of roughly,
teachers and then you go to teacher education, all kinds
of teacher knowledge. So we wanted to ask ourselves: what
should be the domains; and how do we define those; and
what will be the questions we will be asking? So what I
want to try to show you is on a set of six potential
recommendations we could imagine ourselves making. Not
the full content of those, but kind of the domains in
which they would be and say a little bit about the
differences among them and then we have a couple of
comments and questions for all of you. So these will come
in the form of, we think we would be making a
recommendation that something about "x". Okay, so I'm
going to tell you six of those. You'll get a little sense
of how we've begun to think what the scope might be. I
suspect that the scope is larger than we would be able to
take up for a couple of reasons; one, because we want to
be able to be focused; and second, because the research
base, or the evidentiary base will be wildly different and
I think you'll see that as you hear them. Even though
you'll be not surprised to hear most of these things as
potential demands of this group. So, clearly, there will be something about teachers’ mathematical content knowledge and something about the importance of teachers’ mathematical knowledge and its relationship to student gains. It's clear we're going to want to make some kind of recommendation about that so that it generates the least sort of agitation in our group. We spent some time there beginning to detail what we thought would be the resources we would use to fill the specific nature of that recommendation that we would make. So I can answer questions about that if you want, but I'm going to go on to the second one. The second one we explored was, we thought — and we didn't explore this in great deal of detail, but we thought we might be wanting to make some recommendation about entry requirements to both undergraduate and graduate teacher education programs. In other words, admissions requirements; and for that we would want to investigate what's known about the relationship between the sorts of evidence that's currently gathered and whether we know anything about the relationship between entry requirements and teachers' success in their professional preparation and their subsequent success as teachers. So that has to do with entry two, teacher training. The third area, which we thought we might want to be making some kind of recommendation, would be something about -- and I'm going
to state this with a qualification that occupied a lot of our discussion. Perhaps we would want to make some kind of recommendation, not only about the mathematical content that teachers need to teach, but something about the intersection of mathematical content and teaching. So I guess that intersects the third group, but, for instance, do we think we'd be making recommendations about the nature of what are sometimes called content pedagogy courses or methods courses. Do we have something to say about that which really is more about, you know, what is known about the interplay content knowledge and skill in teaching? We found ourselves arguing a bit about whether we should be trying to make recommendations at all about the curriculum of teacher education — that is, what programs offer, whether they're alternative programs or campus-based programs. Should we be specifying the nature of the courses or should we instead — and I think we spend more of our time thinking we might end up instead — trying to make recommendations about the nature of what teachers need to know and how that could be demonstrated, rather than, specifically, how different programs might deliver that. We, in part, we're trying to sort out how our panels work, in particular our sub-groups work, intersects the work of the NRC panel that we mentioned this morning. So there's currently an NRC panel on teacher education that's also a result of a Congressional mandate and we,
fortunately, have one in our panel and that we thought it important to try to consider what's smart about the way this panel ought to work and even if there's another panel on the way right now on teacher education. This is a topic, I think, for the whole group to talk about. The fourth area then, moving on from content pedagogy was, we thought that we should be able to make some kind of statement based on the research on what are sometimes referred to as alternative routes to certification, or, uncertified teachers versus certified teachers. In other words this would be a claim in the area of what's known about the traditional requirements to become a teacher; and whether there are alternatives about which we know something that we might make a recommendation about that have to do with what's responsible to require people to know and what are the ways that people could be qualified to teach, but might not work the same as the traditional ways given what do we know about that. This was more thinking that we should get on top of that literature and that this report should be able to say something about that. A fifth area was that we thought we might want to be able to say something about the - because the Executive Order mentions it - something about the retention and tenure of teachers. For instance, should we be able to claim that districts should be able to associate teachers' promotion, compensation, tenuring, and so on with their
ability to produce student achievement. Would we know anything about that? Do we think we want to make some kind of claim about the condition of teachers’ ongoing work and the relationship of that and the expectation that they help kids learn? The sixth area was, one you would predict, something about we think we want to be making claims about effective professional development. What features of professional development are most likely to equip teachers with the capacities to predict student gains; and we talked in some detail about what's known about the importance of teachers having opportunities to learn, what we ended up referring to today, in quotes, as “instructional development in mathematical content knowledge”; that is, mathematically intensive opportunities to learn, but on mathematics that is directly related to the mathematics that teachers have to look for. We talked about that, and we began to probe what sort of research there be for that. Finally, we thought about whether our group thought we should have something to say about certification requirements for entry to the profession, which is a slightly different point than the alternative routes question. So what's known about entry requirements and their relationship to student achievements, different kinds of certification or licensure requirements? Here we began to find ourselves in one of the - I think many come under that arbor they'll
find their selves in, which is - if you think about the six that I've mentioned -- different kinds of intentional evidentiary basis, this last one might be one that one of our group members referred to as common sense plus the dire need for intelligent social policy. At the same time what is actually known about the relationship between the professional relevance or lack thereof of current certification requirements. Do any of the requirements that teachers currently demonstrate to become teachers; do we know anything about the relationship of those and their capacity to teach well? So we thought that was the literature we needed to investigate. We also noticed that this was one, unlike the mathematical content knowledge claim where what we'll have to refer to will be a whole mix of things, and it's one which people have lots of opinion. So I think that our group finds itself with a set of six potential areas in which to make recommendations, but we've only really probed two or three of those to see what sort of research there is, what other sorts of evidence there might be; for example, when and how might international evidence on international practice be helpful to this group; when would just descriptions of the variety of practices that exist in this country with teacher licensure, when would those be helpful to us, and how we'll relate those to being able to make intelligent recommendations. So that may be a little sketchbook of
the efforts we've made to kind of sketch the domains and
also maybe you can see something about the difficulty we
will probably run into about what sources we'll have, if
we in fact want to make any recommendations. I think one
thing that I would like to say as the Chair of this group
and see if any of my good members want to add anything or
if you have questions for us is, I really worry listening
to these four reports about the following thing, I and
several other members of this panel have sat on a number
of panels over the last five to ten years that have
produced very nice looking reports that all of us own.
I'm really concerned that we answer the question early in
this work. How this report is going to differ from --
and I'm not going to name them all -- the various reports
and other kinds of documents that already exist that have
attempted to do exactly what it appears we're doing -- to
make recommendations about teacher preparation or
instruction or the content that teachers ought to be
teaching. If we're not going to do something that is
going to have an impact and differs in any significant way
from what's already been produced, I think we really have
to ask ourselves some questions before we continue down
this path; because a lot of what we're saying right now --
including our own group -- my own group -- sounds a great
deal like things that have been done without a huge amount
of impact I might say and without some of the foundation
that we're all craving. So, whether it's at this moment or some time, I really would like us to talk about that before we continue making these lists and thinking about what's out there. Does any member want to correct or add to my report?

DR. FAULKNER: Comments? Tom.

DR. LOVELESS: Well, this goes to your last point. One of the problems that we discussed and Russell pointed out - I just want to underscore it once again - is that in a sense we really don't have enough time to conduct meta analyses on all of the various documents that we are going to be considering, which means that we are then going to be leaning very heavily on meta analyses that have already been conducted. When you look at Deborah's topics for instance -- content knowledge and student gains -- there has been some meta work on that topic. Some of the others like alternative routes to certificate, actually there is a growing body of research, but there's no good solid meta analysis of that work out there. So that puts us in the position, it seems to me, the following: If we rely on meta analysis for our work, chances are we're not going to really produce anything new. That knowledge is already out there; and yet we don't have time to produce new meta analysis that may shed light on topics that we don't know yet what the evidence generally states. That's a conundrum I think we need to
somehow crack here today if we're going to make a subsequent contribution.

    DR. FAULKNER: Russell.

    DR. GERSTEN: I think the last question Deborah raised is something that has been a concern of mine; is how is this -- or how can this be different -- more of a contribution than these earlier reports of the last five, six years. With the National Reading Panel, they grappled with that early on, because there had been an NRC report about five years earlier -- four or five years earlier. How could they do something that is different and I think that is very, very important, because it's so easy to drown in either the details of, you know, collecting these things: which things do we reread; how do we reinterpret; why do we reinterpret; but, also, I think, the idea what should we focus on needs to be determined by that. This is part of a conceptual issue as well as methodological and it's -- I think it's just something we need to really, really try to address. I can't think of an easy way to address it directly, but it's all -- the whole panel needs to look at it.

    DR. FAULKNER: Other discussion? Wade, do you -- or that's Deborah's light. Were you about to say something?

    DR. BOYKIN: I was but I'm slightly at an angle.
DR. FAULKNER: Turn your microphone toward you.

DR. BOYKIN: To what extent did your subcommittee consider the issue of different forms of preparation for elementary level versus secondary level teachers? I mean, secondary level teachers in terms of math specialists. Elementary, they have to be jacks-of-all-trades and the whole class self-contained instruction going on. So I'm just wondering did you definitely tackle this?

DR. BALL: Thank you for mentioning that. We realize many times that as we began to look at what evidence there is and what sorts of studies that those were either elementary or secondary and that the kinds of studies that have done are pretty different, and, in fact, the literature is stronger for elementary teachers, than it is -- that is there's more done -- not done, done as in finished, but there have been more studies at that level than at the secondary level and that is an important thing to keep in mind. We did playfully explore, or maybe not so playfully, the possibility of making recommendations that were related to really different structures of elementary school teaching so that didn't continue to be the case that, in fact, teachers could concentrate on the subject more. We haven't pursued that further yet, but that is another thing that came up, and I wanted to
mention it's very important to us.

DR. FAULKNER: Sandra.

DR. STOTSKY: In relation to what Tom was just saying before, which I think is very important, he emphasized we do have these meta analyses to rely on and I don't see that we just want to be repeating them -- their summaries. In addition to the charge, which we do have to answer, and I recognize that we have an obligation to respond to the Executive Order and its mission, there is one of the objectives which asks about research and here it says -- I may be repeating what I said this morning, but some incisive ways of looking at the gaps or problems in the research literature could be the contribution for us to make. I know that other groups have also made recommendations for further research. There probably isn't any document that doesn't have that as it's final paragraph, but most of them are fairly vague and can apply to a whole range of ways to spending money. I think it would be useful for us to think about, and with full panel approval, some more concise and insightful statements about what we might see as fruitful policies that need some evidence and where there is a need for some specific kinds of research that would make this particular panel come up with some things that maybe haven't been said or could be said in a different way.

DR. FAULKNER: Liping.
DR. MA: I see a difference between this panel and other recent ones. We have a clearer goal—a specific goal of preparing students to learn algebra. That is pretty clear so if we all work to this goal, that may make the difference between this panel than the other reports, but I don't know whether I am correct or not.

DR. FAULKNER: Diane.

MS. JONES: I think the other place where we hope there is a significant difference is some of these documents have been consensus documents based on expert opinion or maybe practice and I think the difference here is we're not necessarily striving for consensus, we're actually looking to review where the research is robust and where it's not and where it is, what that research says and where it's not, what the research doesn't say. I think some of these reports have included, you know, have been based on some assumptions that maybe in turn are not based on research. So I think that's what this will contribute in a way that's maybe different than the other documents is it's not a matter of what we all think or what we all vote on, it's a matter of which research we chose to pursue and what we find or don't find in that research basis. So I think when we wrote the Executive Order, that was what we perceived as the difference and certainly—the goal here is teaching and preparing the students to be successful in algebra. So that makes it
somewhat different than some of the other documents that looked at issues far beyond.

DR. FAULKNER: Let me comment, myself, on this issue. I think Deborah did us a service by bringing it up, and I think Tom -- The answer I would give is that what can make this report different and more effective is a combination of two things; focus and who's listening. The first part is exactly what Liping said, this is focused on a well-defined problem of education in the United States that is widely recognized and generates immediate concern. If we can adhere to the focus and truly address the question of algebra and how do we become more effective, we have, I think, a significant chance of impact. The second thing is who's listening. This report was asked for by the President of the United States and the Secretary of Education. People who have in mind actually pursuing programs that are informed by what we do. So it is not as though this is a document that's being thrown into the winds of current discussion. It has been asked for by people who can act. It may well be, as Tom suggests, that we will end up using and reporting conclusions based on digestions of research that already exist or are incipient and have already, of course, been, because of that, available to the community; but that's not the same thing as reporting them in conjunction with a well recognized particular problem and having it listening
to by people who can act. So I think that sometimes the
effect is in the time when the story is told and the way
it is told, but I think that what that says to us is that
we need to tell what it is we want to tell in a way that's
well formulated for those who are in a position to
actually understand what it is we're saying and be able to
formulate a program actually based right off what we have
to say. That's my little speech. Tom.

DR. LOVELESS: Tom Loveless. The other way
I'm thinking in which we can be different is to be candid
about the questions that we search for research and don't
find it. Even if those topics debunk popular myths that
are currently in the math community or the math education
community. It's very important that we do that as well;
and very often the tenor of many of the reports that have
been cited here today are more hopeful than evidence
based.

DR. FAULKNER: Couldn't agree more.
Deborah.

DR. BALL: I just want to link the beginning
of today with what we're talking about right now, because
every group encountered that the evidence base is going to
be problematic. So if that's true that we're going to be
able to do something that, as Diane said, has an evidence
base, that was a struggle today and it wasn't just in our
group. So I just want to exhort us. We can't settle this
right now, but that problem - just because we have a well-defined question doesn't mean the research is going to match that question. We have a very small challenge ahead of us to decide how far, given what Russ said this morning, how to be transparent about the quality of the evidence and such is a very nice way to handle it. We're going to have some very tough stuff ahead of us. To align what's out there for this particular problem, which is actually not quite as well defined as we might like it to be, and the connection of what's available to that problem. So any preferred plan, you know, we can't go on with it at this moment. I just think that we're going to have to keep coming back to it or it will, in fact, end up where all the other reports have, ending up out there with very similar aspirations; and I don't think we should go into each one of them, but I think there were reasons why they're sitting on our shelves right now and why they haven't had much impact; and we shouldn't be too arrogant about the likelihood that will be different without really understanding why it's been difficult to create reports of this kind in this field. So that's all. I feel like we see the problem. We should just keep trying to tackle it as we work with it.

DR. FAULKNER: Well, we won't be different without a clear and accurate message.

DR. GERSTEN: I want to support one point
that Larry made about focus, because if I look at - I mean, if I compare the NRP report - one reason, of course, it was so likely disseminated was reading first -- you know, basically incorporated and so for the states to get this huge pot of money, they had to incorporate the National Reading Panel Report; so that certainly enhanced dissemination by a factor of about ten thousand. Now, you know, that wasn't the only reason. There was a focus too that is rare in a document. I know reading as well as I know math, or some areas a lot better - but I think that there were many things that were excluded that are very, very important. They didn't deal with the reading and writing connection. They didn't deal with family literacy. There are all kinds of things that they said - we're not saying they're unimportant, but we want something to come across that makes some sense to people; and then we can be candid in these areas. We can be candid in five areas, but if we list twenty-seven areas and say, well, we don't really know much about calculators, we don't really know much about manipulatives. It's a little bit of a dumb issue, because we don't know of any programs that don't use them, so - you know, they're fine to use; but we want to have something that is compelling and coherent, but we can't answer, but the idea of what are we going to cut even if we invest time going through all the TIMSS, and some of
these old meta analyses on groupings and all. What is there to cut and what can be different here? I think that really needs to be our charge, because we'll get inundated and that is going to be the difference between this having an impact; because if it's all muddled, even if it's funding is contingent upon it, if it's not going to -- people aren't going to know what to do with it, but they're not going to do anything productive with it.

DR. SIEGLER: Can I make a comment.

DR. FAULKNER: Yes, please. Is that Bob or is that Dan?

DR. SIEGLER: It's Bob.

DR. FAULKNER: Okay.

DR. SIEGLER: Okay, so one of the things I heard today is very much to what Russell just said and I think a way of thinking about it is to try to come up with one or two key principles that they think are of overriding importance and really well formulated and where the evidence is very clear. One of the ones that the learning processes sub-panel was talking about a lot and had a lot of support - I think you heard the support, was the mutually reinforcing nature of conceptual and procedural understanding in that and the timing of this issue is ripe right now. Larry alluded earlier to the importance of timing. This is something that there's been a war about and everyone is sick of the war; and it was a
poorly thought out war to start with.

DR. FAULKNER: Are you done?

DR. SIEGLER: The idea is just that if we come up with positive recommendations for a whole bunch of principles they'll be a way of insuring that the reports have as much impact as possible.


MR. WILLIAMS: Vern Williams. Deborah, I have a question for your committee. You mentioned that you would be studying alternative forms of teacher certification, but maybe Tom or someone mentioned that there's not a large body of research relating to that, but it's actually crucial to solving a problem, because we have such a shortage of qualified math teachers in middle schools. One of the principal reasons is that many bright college students refuse to get involved in education, because of hoops that they're forced to jump through, and most of those hoops aren't worth jumping through. Do we really need evidence beyond statistics in some of these areas to come to the conclusion that, for instance, current certification is a big problem?

DR. BALL: I think what our group said is that we would - in fact, there is research on teacher preparation and it's relationship to teacher quality and
student learning and that we'd be reviewing that literature. We didn't say there wasn't - I think that Tom said there wasn't a meta analysis of that work. I think you're pointing to one of the issues I raised, which is that we asked ourselves the question about not the quality of teacher preparation, but how across the territory of our subgroup, how different forms of evidence are going to play in the kinds of recommendations the panel will make. So without commenting on the nature of what particularly - your own analysis, I think the question of evidence for this one was important and I did try to raise that.

DR. FAULKNER: Wade.

DR. BOYKIN: I'm just wondering if I've heard the scope that's been sort of carved out by the various subcommittees and I wonder out loud about where's the place for evaluation of - what should we call them - canned proper name math intervention programs. The Missouri Math Project, Cognitive Guidance Instruction, Project C -- do we consider these kinds of programs in our charge? So, you know, what panel is going to take responsibility for those kinds of things?

DR. GERSTEN: That would be us. That would be our charge. The things that aren't necessarily - you know, a curriculum from a commercial publisher. We would definitely consider them in our group.

DR. BOYKIN: But you take something like,
for example, Project C or the Missouri Math Project, there is a development component built into them.

    DR. GERSTEN: Right.

    DR. BOYKIN: They have very clear notions about learning processes. In some ways they do cut across categories; for example, Project C tried to teach inner-city kids algebra in elementary school. To some degree, there is some success that they achieved. So the sequencing across curriculum comes up there. So it just - - so in other words, they don't fit neatly into one of our categories. If you all are going to take them on, more power to you. I just didn't think they fit any one of these four areas.

    DR. GERSTEN: I had the same sentiment. If you folks want to look at those, because -

    DR. BOYKIN: By all means, please.

    DR. GERSTEN: I feel like it's more of a professional development intervention in the scheme of things. But you're right. It's a way of teaching. It's not really a curriculum. It's just the way you organize.

    DR. FAULKNER: It's an instructional program, I mean, it seems to rightly fit into Russell's area.

    DR. GERSTEN: Yes, yes.

    DR. STOTSKY: This is a question of a different order. I'm thinking of whatever this final
report or drafts are going to be -- probably not the
drafts, but the final report -- and whether you're
envisioning or whether you see the order envisioning some
sort of joint statement that reflects, or seems to
reflect, everyone; or whether there may be also some
individual statements, visions of individuals that are
not, necessarily, captured by whatever appear as the
recommendations or suggestions for research. I'm just
trying to get a sense of whether this might be a different
way of thinking about this report in terms of individual
differences about some goals that might be there with
rationales. That could be appendices or other.

   DR. FAULKNER: I think it's highly desirable
for us to have a panel report and to say what it is we
believe as a panel. I think it weakens reports to have
minority reports; sometimes it can't be avoided, but I'd
like to avoid it. Skip.

   DR. FENNELL: Going back to your comment of
about ten years -- ten minutes ago -- it feels like ten
years ago -- and that's the issue of focus and who's
listening once this report is out on the street. It seems
to me that it has the potential to frame a really
important mathematics that lead to algebra; really
important mathematics that's impacted by the research on
learning; that's impacted by what we know about
instruction and how that connects to teachers, regardless
of how prepared. That's saying a lot. The trick is -- I think Deborah captured it pretty well -- we have at this moment laundry lists of things that are out there that could impact. Part of me thinks that we can figure out the math pretty quick; then we address that mathematics through learning and instruction and teachers.

DR. FAULKNER: Camilla.

DR. BENBOW: I think we're just at a very natural stage with this right now. We've cast a very wide net. We're looking at a lot of different things. It feels like a lot of chaos. Maybe we don't know what terrain we've already treaded in the past. I think as we struggle with the issues, I think the signal will come out of the noise a little bit and I think it will probably become clear with time whether -- five or six messages we want to deliver. It's too early in the process to know what they are right now, but I have a feeling that over time as each separate works -- and we're already hearing overlaps and things like that. It will come through to us. So I think we're at a very natural stage -- too many topics, too many things we need to look at, but we will start paring. So I'm confident and I think we just need to keep in mind that we can only do so much; and there are only so many things that people can listen to, but we'll get there.

DR. FAULKNER: Good place to stop. Is there
any emergency message that has to be said by anyone? If not, then we'll be adjourned until tomorrow. Let me announce to the public again that we will be taking open comment tomorrow afternoon 1:00 to 4:00 p.m. at the Carolina Inn, not here. Thank you.

(Session 2 concluded at 4:15 p.m.)