

U.S. DEPARTMENT OF EDUCATION

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NATIONAL MATH PANEL MEETING

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Arizona State University
Memorial Union Alumni Lounge

Room 202

Tempe, Arizona

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October 23, 2007

3:00 p.m.

Panel Members:

Dr. Larry Faulkner, Chair
Dr. Camilla Persson Benbow, Vice-Chair
Dr. Deborah Loewenberg Ball
Dr. A. Wade Boykin
Dr. Douglas Clements
Dr. Susan Embretson
Dr. Francis (Skip) Fennell
Dr. Bert Fristedt
Dr. David Geary
Dr. Russell Gersten
Dr. Tom Loveless
Dr. Liping Ma
Dr. Valerie F. Reyna
Dr. Wilfried Schmid
Dr. Robert S. Siegler
Dr. James Simons (Not Present)
Dr. Sandra Stotsky
Mr. Vern Williams
Dr. Hung-Hsi Wu

Ex Officio Members:

Dr. Irma Arispe
Dr. Dan Berch (Not Present)
Dr. Joan Ferrini-Mundy
Mr. Raymond Simon (Not Present)
Dr. Grover (Russ) Whitehurst

Staff:

Ms. Tyrrell Flawn, Executive Director
Ms. Ida Eblinger Kelley
Ms. Marian Banfield
Ms. Jennifer Graban
Ms. Holly Clark
Mr. Jim Yun

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

2:57 p.m.

DR. FAULKNER: Okay, I think we're ready to go. Let me call this meeting of the National Mathematics Advisory Panel to order. I'm Larry Faulkner. I'm chairman of the National Math Panel. To my left is Camilla Benbow, who's vice chair of the panel.

We are in the, I think, ninth meeting of the National Math Panel. And this is the first open session of the ninth meeting, and I want to welcome everyone who is in the audience to this session. It will be an important session in many ways in that -- this will be the time in which we start public work on the drafting of the Final Report of this Panel. And I'll talk to you more about how that has come to pass.

But let me ask right now about signing services. We have a signer here, and we are glad to continue those services if there is anyone in the audience who requires them. If there is not, then we will discontinue the signing services with the understanding that we can re-continue them if the need develops. So let me ask if there is a need for continuation of the signing services? If not, then we'll go on.

I would also like to express appreciation

1 to Arizona State University for hosting this Panel.
2 With our visit here to Arizona State, this university
3 joins a constellation of eight other institutions
4 around the country where the panel has met to receive
5 testimony and conduct business. From the National
6 Academies in Washington where the panel started its
7 work to Fermi National Accelerator Laboratory near
8 Chicago, from MIT on the east coast to Stanford on the
9 west coast, from Miami-Dade College at the southern
10 tip of Florida to Arizona State, the Panel has
11 traveled across the country to places with strong
12 reputations for educational excellence, and we're glad
13 to be here in Arizona.

14 This university is a leading metropolitan
15 research university in a region of extraordinary
16 growth. I'm not using the word extraordinary
17 casually. What's going on in Arizona is remarkable.
18 And the way in which Arizona State University has
19 coupled its future with the future of this region is
20 unique, I think, in the American spectrum of higher
21 education, and we're glad to be in that milieu for a
22 period of time here. Arizona State has become very
23 widely recognized for its willingness to address the
24 future in inventive new ways with civic and social
25 engagement as a hallmark.

26 Tomorrow morning at 8:15 we'll be, I

1 think, back in this room. And Dr. Michael Crowe,
2 President of Arizona State University, will welcome
3 the Panel and make brief remarks.

4 Let me give a little background on the
5 Panel. The Math Panel was established in April 2006
6 by Executive Order of the President to review the best
7 scientific evidence and to make recommendations to the
8 President and Secretary of Education on ways to
9 improve mathematics learning, with a particular
10 emphasis on algebra readiness and algebra success.
11 After almost 18 months of reviewing research and
12 listening to testimony, the Panel is wrapping up the
13 work of its specialized Task Groups and has begun the
14 synthesis process for the Final Report.

15 After the public comments, which will be
16 our first order of business, the Panel will discuss
17 the outline of the Final Report, which has been
18 developed in draft form through the work of three
19 teams that have worked largely by telephone and email
20 for the past three weeks. Each team was asked to
21 assemble a concept for the Final Report in the form of
22 an elaborated outline, giving the most important
23 findings and recommendations and suggesting an order
24 of presentation.

25 The chairs of the synthesis teams worked
26 the three concepts into a final -- or excuse me, into

1 a single first common concept, a Panel-wide concept,
2 which was taken back to the synthesis teams for
3 separate discussions and reactions earlier today.
4 Over the lunch period, the chairs revised the first
5 common concept into a second common concept on the
6 basis of reactions in the morning session. After
7 lunch the synthesis teams were able to -- were
8 supposed to discuss the second common concept but they
9 didn't actually have time for it.

10 We're going to open the Panel-wide public
11 discussion with this second common concept and you
12 will be able to see it projected on the screen. Now I
13 want to hasten to add that as you look at this, this
14 is a kind of catalog of items suggested to be included
15 in the Final Report. It is not the language of the
16 Final Report. The language of the Final Report will
17 be drafted -- pardon me, in the next couple or three
18 weeks on the basis of this catalog, this concept
19 document that we're talking about here today. So
20 there's a lot that's tentative about what you'll be
21 looking at -- looking at in this document, and we will
22 be having a discussion here among the Panel about what
23 to include, what not to include, and what to change.
24 Pardon me. Something about dry heat, I guess.

25 Now before we start that discussion, let
26 me welcome the speakers who've registered to speak

1 this afternoon. At each meeting of the National Math
2 Panel, we've taken time to hear from interested
3 individuals and organizations who have been following
4 the National Math Panel's work and who want to offer
5 comments for the consideration of the Panel. This
6 testimony has been quite valuable.

7 Our first speaker is Bill McCallum, and I
8 ask him to come forward and to sit at the testimony
9 table. For Panel members, you'll find public
10 commentators listed under Tab 6 in your notebook. Each
11 speaker is limited to five minutes. Panelists will
12 have the opportunity to ask questions of the speaker
13 after their remarks are concluded. So let's go ahead
14 and begin with Dr. McCallum.

15 DR. MCCALLUM: Thank you. As I think
16 you've been viewing I've been walking around the Panel
17 making my comments this afternoon --

18 DR. FAULKNER: Yes. Dr. McCallum, could I
19 ask you to turn the microphone on.

20 DR. MCCALLUM: Is that better? I'm a
21 mathematics professor at the University of Arizona and
22 I direct the Institute for Mathematics and Education
23 there. In addition, I chair the committee on
24 education of the American Mathematical Society. Next
25 year I will start a two-year term as chair of the
26 conference board of the Mathematical Sciences.

1 I'd like to start by thanking the Panel
2 for its work in trying to create clarity and consensus
3 around the problems facing mathematics education in
4 this country. The charge to the Panel covered an
5 enormous amount of territory, almost an unmanageable
6 amount. The Panel has researched and discussed
7 teacher knowledge, instructional practice, student
8 learning and core knowledge of school mathematics. It
9 has navigated significant controversies on these
10 issues and has discovered some areas of consensus and
11 others where more knowledge and evidence is needed.

12 Effective next steps will require the
13 energy of many stakeholders: mathematicians,
14 educators, teachers, administrators, policy makers and
15 business people. I'm not here today to tell you to
16 add anything more to your report. My comments here
17 today are really about how to awaken and harness and
18 direct the necessary energy.

19 The Panel's report will join a series of
20 reports by distinguished groups going back over the
21 last 25 years at least, starting with a Nation at Risk
22 in 1983, through the Glenn Commission report that came
23 out in the waning days of the previous administration,
24 to the recent National Academies report "Rising Above
25 the Gathering Storm," which I recently discovered on
26 another trip to Washington to hear your presentation

1 to organizations is affectionately known as RAGS.

2 The Panel's recommendations might be
3 different from those in these reports, but their fate
4 might be the same. Although there is some movement on
5 turning RAGS to riches for education, the general
6 record of follow-up on these reports is a sorry one.
7 As the panel winds up its work, it must be wondering
8 how to beat that record.

9 Fran Leibowitz said that the opposite of
10 talking isn't listening; the opposite of talking is
11 waiting to talk. Right now there are plenty of people
12 in the national education arena, especially in
13 Washington, who are waiting for their turn to talk.
14 Those of us spread throughout the rest of the country
15 who care about mathematics education are obliged to
16 start thinking now about how to turn your report into
17 a process of listening that leads to action, not more
18 talk. Too many reports have burst upon us like the
19 summer monsoon, only to sink into the desert sands.
20 It's time for us to start making use of the water when
21 it comes.

22 The immediate purpose of the Panel's
23 report is to inform the legislative agenda at the
24 federal level. However, we can't wait for whatever
25 legislation might materialize. Turning the Panel's
26 words into action also requires an urgent national

1 deliberation, conducted in school districts, state
2 houses, state boards of education, and national
3 organizations.

4 On that front, I have a proposal for your
5 Final Report. I would like to suggest that you enjoin
6 a coalition of institutes, centers, and programs to
7 organize a series of follow-up meetings around the
8 nation. These meetings would mine your work and
9 extract nuggets around which to build their own
10 agendas for action and programs for research. An
11 important resource would be not only your report, but
12 also the rich set of documents that you have
13 accumulated during these periods of public comment,
14 especially in areas where the panel has not yet found
15 common ground.

16 Some meetings would have a focus on
17 influencing policy, taking recommendations from the
18 Panel's report that can be turned into immediate
19 action. For example, there is much that institutions
20 for higher education can do right now in teacher
21 preparation and professional development. Other
22 meetings would pick up the ball in areas where more
23 research is needed and develop research agendas of
24 their own to fill in these gaps.

25 Should the Panel take up my suggestion,
26 the Institute for Mathematics in Education stands

1 ready to step up. We have the capacity not only to
2 run some of the meetings envisioned in my proposal,
3 but also to collate and orchestrate the efforts of
4 other centers. Collaboration is the hallmark of the
5 institute. We specialize in bringing together
6 communities that are sometimes worlds apart:
7 mathematics departments, colleges of education, school
8 systems, government agencies, business and commercial
9 and non-profit education organizations.

10 I have made preliminary contact with some
11 of the organizations that might help carry out this
12 work, such as the Mathematical Sciences Research
13 Institute in Berkley, the Focus on Mathematics Project
14 at Boston University, the Center for Science,
15 Mathematics and Computer Education at the University
16 of Nebraska, the Center for Mathematics Education at
17 the University of Maryland, and CRESMET, the Center
18 for Research on Education in Science, Mathematics,
19 Engineering and Technology here at Arizona State
20 University.

21 There are many more centers I have not had
22 time to contact but which I am sure are ready to join
23 such an effort. As A Nation at Risk memorably put it,
24 if an unfriendly foreign power had attempted to impose
25 on America the mediocre educational performance that
26 exists today, we might well have viewed it as an act

1 of war. That was almost 25 years ago and we are not
2 much better off now than then.

3 We ourselves are the unfriendly power.
4 And we are also, therefore, the solution. I urge the
5 Panel to draw on the resources of local and national
6 centers and catalyze the formation of a network for
7 positive climate change in education.

8 DR. FAULKNER: Thank you, Dr. McCallum.
9 That was a useful set of comments and we appreciate
10 your sharing your views with us.

11 Are there comments from the panel? One
12 thing I can say is that I think that the question of
13 what follow-up will happen is always a question for a
14 group that undertakes a study like this. And we don't
15 know the answer.

16 One thing that is true in this situation
17 as opposed to others in which I've been engaged is
18 that the responsibility for follow-up is actually
19 diffused in this country over many agencies,
20 organizations and authorities. And that actually
21 gives us some hope that somebody, somewhere, may
22 actually act. And we aren't quite as dependent on the
23 idea that a single power or a single authority will
24 act.

25 Any other comments that you wish to make?

26 Thank you.

1 All right. Second in the group of
2 testifiers is Janie Zimmer, National Council of
3 Supervisors of Mathematics (NCSM), board member.

4 MS. ZIMMER: Honorable members -- is this
5 on? Honorable members of the National Mathematics
6 Advisory Panel, thank you for the opportunity to speak
7 to you today. I am Janie Zimmer from Research Base
8 Education, and I am speaking on behalf of the National
9 Council of Supervisors of Mathematics, or NCSM, a
10 group of leaders in mathematics education. I serve on
11 their board.

12 First of all, we would like to tell you
13 that the National Council of Supervisors of
14 Mathematics (NCSM) greatly appreciates your work
15 throughout the past year and a half. We realize how
16 important your task is and we are hopeful that your
17 final report will have an impact on the children in
18 our nation. NCSM appreciates the opportunity today to
19 provide further input prior to your final report. We
20 sent written input to the panel about a week ago and
21 that input is most likely in your binders.

22 The input that we sent touched upon
23 several issues, some issues addressed to the entire
24 panel and some to different task groups. Today,
25 however, I would like again to highlight one of those
26 issues, what we see to be the most critical issue in

1 the work of the Panel, and that is equity, the
2 opportunity for every student to achieve a high level
3 of mathematics.

4 As we examine the total work of the Panel,
5 we currently see few references to equity and the
6 opportunity for every student to achieve high level of
7 mathematics in order to be prepared to be successful
8 in algebra. There are some references to students
9 with learning disabilities and a reference to gifted
10 and talented students, but at this time, or prior to
11 this meeting, we did see not addressing the needs of
12 those from poor families, those with -- those whose
13 native language is other than English, those who have
14 diverse learning styles, those students of color, and
15 those who have strong and different cultural
16 backgrounds.

17 We realize that you are still in the early
18 stages of your report, yet emphasize that the needs of
19 these students must be woven into the report in a more
20 robust way. In his most recent book, The Art and
21 Science of Teaching, Robert Manzano references many
22 affirmed research studies that highlight the
23 importance of planning for instruction that can
24 significantly impact student achievement. He
25 emphasizes percentile gains based on teacher actions
26 and commitments.

1 In the third annual Brown Lecture in
2 Education Research, Linda Darling-Hammond presented
3 "The Flat Earth and Education, How America's
4 Commitment to Equity Will Determine our Future." Our
5 poorest, most needy students often have the least
6 access to the best teachers and proper resources, she
7 states. Study after study documents that there are
8 significant differences in factors such as class size,
9 school size, teacher quality, curriculum quality, and
10 availability of resources and equipment in what is
11 found in our affluent, suburban schools compared with
12 what is found in our center city schools that are the
13 homes of our African-American and Latino students.
14 Much of the difference in school achievement between
15 minority students and others is due to the effect of
16 the unequal school opportunities, and in particular,
17 greatly diverse access to high quality teachers and
18 teaching.

19 In addition, tracking persists in the face
20 of growing evidence that it does not substantially
21 benefit high achievers and tends to put low achievers
22 at a serious disadvantage, in part because good
23 teaching is a scarce resource and thus must be
24 allocated.

25 Today the world is flat. And in this flat
26 world the United States is dramatically losing ground

1 educationally. We set standards yet we continue to
2 struggle as a nation. Most of the top achieving
3 countries now graduate virtually all of their students
4 from high school, while the graduation rate in the
5 United States is about 70 percent. And for cities
6 such as Baltimore, Denver and New York City, the
7 graduation rate is much less than 50 percent.

8 Possibly more than any other
9 recommendation, the recommendations of equal access
10 and equal opportunity, the recommendations of equity
11 are the ones that need to be made by you, and need to
12 be made very strongly, so that students who are now
13 truly left out will be given a strong education.

14 Once again, the National Council of
15 Supervisors of Mathematics (NCSM) thanks the Panel for
16 the tremendous amount of work and time that you have
17 put into this project, and again invites you to call
18 upon us to inform your work and to provide support in
19 any way that we can. Thank you for this opportunity.

20 DR. FAULKNER: Thank you, Ms. Zimmer.

21 Questions or comments from the Panel?
22 Vern?

23 MR. WILLIAMS: You mentioned that there
24 were some differences between quality of services
25 offered lower income students and middle class
26 students, and you mentioned quality of curriculum.

1 Could you answer two questions? What do you think the
2 differences in curricula are? And my second question
3 would be have you heard of Project Follow Through and
4 what's your opinion of it?

5 MS. ZIMMER: When I look at curriculum --
6 and I've had the opportunity, and I truly say
7 opportunity, to work in Baltimore City and also to
8 work in Howard County. One is a rather affluent
9 school district; one is a struggling city school
10 district. The quality of curriculum is not at all to
11 be compared.

12 Curriculum is designed by the school
13 district in which the teachers are teaching, and the
14 teachers design it for the most part. The curriculum
15 in Howard County is very tight. It is seamless. It
16 is presented in a way that a teacher can look at that
17 student's grade level and see what was done in the
18 previous two or three years and what will be coming in
19 the next few years. In Howard County the curriculum
20 is -- I mean in Baltimore City the curriculum is much
21 older. It is not seamless, and it is not very tight.

22 I cannot comment very specifically on
23 Project Follow Through, and I would be remiss in
24 pretending to be an expert in that, but I can speak
25 very, very intimately from those two school districts.

26 Also, I can say in Philadelphia, where I've worked

1 closely, I do not see a strong curriculum. In
2 Redding, where I've worked closely, I do not see a
3 strong curriculum. In the Gettysburg School District,
4 where I have done some services, I do not see a strong
5 school curriculum.

6 MR. WILLIAMS: But can you identify some
7 characteristics that you have in mind when you talk
8 about a strong curriculum?

9 MS. ZIMMER: A strong curriculum needs to
10 identify to the teacher exactly what it is at this
11 grade level that your students are responsible to
12 master. You need to look at what are the things that
13 you will be introducing, what are the things that
14 students should master at this grade level, and what
15 are the things that you should maintain at this grade
16 level.

17 Also, a strong curriculum should place the
18 content of this grade level in context of what comes
19 before it and what comes after it. When we look at a
20 teacher teaching a grade level, I think that at the
21 St. Louis meeting we looked at the slide presented by
22 the Teachers Task Group that said teachers should know
23 at least what they are teaching or what their grade
24 level's teaching.

25 I have a problem with that and we did
26 address that in the -- what the National Council of

1 Supervisors of Mathematics (NCSM) sent in, because we
2 firmly believe a teacher needs to know far beyond what
3 they're teaching. Because if you're teaching a third
4 grade class and you know what you're teaching, and a
5 child comes out with a question that is beyond that,
6 how do you then respond to that? How do you prepare
7 your third grade students to be successful in fourth
8 and fifth grade mathematics? You can't do that just
9 by knowing what you are teaching at that grade level.

10 Your curriculum needs to be able to extend
11 beyond, or a teacher needs to be able to extend beyond
12 what the curriculum is, but to focus on and to be able
13 to test what it is that you're responsible for
14 students to master at that grade level. And as
15 teachers are teaching, they need to take
16 responsibility for having students master at that
17 grade level so that they will be prepared as they go
18 on to the next grade level.

19 DR. FAULKNER: Tom?

20 Dr. LOVELESS: Thank you for your
21 presentation. The two states that I heard you mention
22 and focus on are Pennsylvania and Maryland. Both of
23 those states have math standards and frameworks.

24 MS. ZIMMER: That's correct.

25 DR. LOVELESS: And in fact both of them
26 have had them for some time. They're not new to

1 that --

2 MS. ZIMMER: That's correct.

3 DR. LOVELESS: -- to that ballgame. To
4 what extent is what you have just laid out to us and
5 the heterogeneity of districts within both those
6 states, to what extent do you blame the state
7 standards, or should the state standards be focused
8 more so that this kind of thing doesn't happen?

9 MS. ZIMMER: I'm not so sure that I blame
10 the state standards. As you know, Maryland has
11 changed their standards from the more integrated
12 program, or problem solving based program, to a more
13 rigid, discrete type standard program. I'm not so
14 sure that I blame the standards as much as I blame the
15 curriculum in the school districts and their
16 preparation of the teachers, and the resources that
17 are available to school districts, and especially
18 large school districts, large urban school districts,
19 and poor school districts, and the ability of school
20 districts to really look at what do we do with
21 children with learning disabilities. This is a real,
22 real problem. This is a real problem.

23 This is where our urban school districts
24 are really falling back in my estimation. And I'm
25 speaking as Janie here. I can't -- haven't polled the
26 National Council of Supervisors of Mathematics (NCSM),

1 so I'm speaking as Janie. Students with learning
2 disabilities are not students who are dumb. I think
3 in one of the sessions I shared with you that there
4 are 13 or 14 different categories of learning
5 disabilities. Only one of those is low IQ. And yet
6 when a student is in a class and has an Individual
7 Education Program (IEP), teachers have an attitude
8 that this child is not up to par with everyone else.
9 That child can be up to par if the teacher believes
10 they can be up to par, and if the teacher takes the
11 time to do the things that will meet the needs of that
12 child.

13 Now, do I know all of the things that they
14 can do? No, I don't. Do you have access to all of
15 the research that's available? You have access to a
16 lot more research than I do. But -- and I know it's a
17 very difficult task, but we have to look at what are
18 the things that our students who are not English
19 speakers, what are the things that will get them to
20 learn mathematics and be prepared for algebra? What
21 are the things that will get our students who are from
22 poor families, what will get the things -- have those
23 students achieve mathematics, to be excited about
24 mathematics?

25 There's a lot to do with technology.
26 We're talking about the video game generation.

1 There's a lot out on that. Marc Prensky talks about
2 that. He talks about the digital natives and the
3 digital immigrants. There's a lot that will turn
4 those children on and get them excited about school
5 and about mathematics, which will get them learning
6 the mathematics. But we have to have an open mind,
7 number one, and our teachers have to be invested, they
8 have to believe, they have to have the training. And
9 in our urban districts they're not getting that
10 training.

11 In Howard County, where I was a
12 coordinator of mathematics, they have very rich
13 training. In Fairfax County where Vern is a teacher,
14 they have very good training. We coordinated a lot
15 with Fairfax County. They have very good training,
16 but that's your more affluent suburban district.

17 Well, what's happening in Washington,
18 D.C.? What's happening in New York City? What's
19 happening in Detroit? What's happening in
20 Philadelphia? These are the large populations of the
21 United States. We are looking at the world getting
22 flatter and the United States is falling behind in
23 education because of that. And this Panel has a real
24 chance to look at how can we address equity. And I'm
25 not sure what we're actually going to say, but it's
26 something that you've got to do. It's got to be part

1 of that.

2 DR. FAULKNER: Liping, did you have a
3 question?

4 DR. MA: Yes, I was wondering if the
5 students with disability in math are the same group of
6 students with disability English or reading? Did I
7 make sense, like is it the same group or -- if yes, so
8 what does this mean to us?

9 MS. ZIMMER: A lot of times, especially in
10 elementary school, children are grouped. And they're
11 grouped according to ability in reading. And then
12 they are in classes where their math just goes along
13 with that ability in reading. Other times we see
14 schools where students are pulled out for acceleration
15 in math.

16 There's a lot of research, and in the paper that
17 I just gave you I give you five or six references to
18 research that is showing that classes where you have
19 pullout of gifted and talented students are not really
20 beneficial for low ability students. And they're also
21 not that beneficial for your gifted and talented
22 students or your high ability students. You have
23 those references in the paper there, which you will be
24 getting. I'm not sure if that answered your question.

25 I'm not sure that I understood, you
26 know --

1 DR. MA: Yes. Maybe --

2 MR. FAULKNER: -- your question.

3 DR. MA: My question is that aren't those
4 children disabled to learn math same as children with
5 disability learning English?

6 MS. ZIMMER: Oh.

7 DR. MA: Who they --

8 MS. ZIMMER: Okay. Children who are not
9 speakers, not -- whose native language is not English,
10 are not necessarily disabled. It's a different
11 category of students. Students who are identified
12 with learning disabilities are students who might be
13 autistic, who might have Attention Deficit
14 Hyperactivity Disorder (ADHD), who might be low IQ,
15 who may have other disabilities. English language
16 learners, students whose home language is not English
17 are not considered to be learning disabled, but
18 they're considered to be non-English speakers. And so
19 as they're learning the mathematics, they're also
20 learning the English.

21 We have a lot of students here from other
22 countries that are learning the English language along
23 with learning their mathematics. So the difficulty is
24 that they don't always understand the language and the
25 explanation in the classroom, and so they're having a
26 difficult time learning the mathematics but that's not

1 necessarily a learning disability as one of the
2 classifications of learning disabilities.

3 DR. FAULKNER: Wade?

4 DR. BOYKIN: I also want to thank you for
5 your comments this morning -- this afternoon. But a
6 lot of your comments with respect to equity matters
7 focused on teachers and teaching quality. Given that
8 you represent the National Council of Supervisors of
9 Mathematics (NCSM), what role do you think supervisors
10 play in dealing with equity matters?

11 MS. ZIMMER: Supervisors play a humongous
12 role, but supervisors need to have access to the
13 teachers and they don't always have access to the
14 teachers. In large urban districts supervisors may
15 see the teachers once at the beginning of the year,
16 maybe a half-day or a full day in February, maybe one
17 other time during the year. They also have an
18 opportunity to go in with the teachers to visit them
19 in the classroom.

20 In say Baltimore City you may have 85
21 schools that a teacher -- that a supervisor is
22 responsible for, and you don't have that many
23 supervisors in the city district. Philadelphia's even
24 more. I think they have a hundred -- and don't quote
25 me on this, somewhere in the neighborhood of 165 or
26 175 schools in Philadelphia. And although they do

1 have a staff, their time is limited. They do offer
2 workshops, but they're offered on a voluntary basis so
3 all of the teachers are not required to come. They
4 come if they want to come, but they -- the people who
5 probably don't need to come as much are the ones who
6 come; the people who really need to come don't come.
7 So access to the teachers is not that -- there isn't
8 that access to the teachers that need it.

9 On the other hand, I will say in many of
10 the suburban districts with which I am familiar, I do
11 see that there are two or three days in the summertime
12 where they have access to all teachers. I do see that
13 when a new program is implemented it's not a voluntary
14 come and get training, it's you will be here to get
15 training and that is time that is allocated to those
16 teachers. I do see afternoons scheduled when teachers
17 will come together for additional training and also
18 for sharing sessions. And many times the sharing
19 sessions will be monthly. They may be voluntary, but
20 I see a much larger attendance. Again, that goes to
21 the quality of the teachers.

22 I also see and I add one last comment on
23 that, as a teacher, or as -- I was a teacher and then
24 a supervisor in Baltimore City -- I would see many
25 teachers begin teaching in Baltimore City because
26 that's where they could get a job. And then after

1 two, three, four, five years they would move to a
2 county system. Number one, the pay was higher; number
3 two, the resources were much greater.

4 This is a big problem in our nation. And
5 I'm not sure what this Panel can do about it. Maybe
6 just state it, state it strongly. But it is a big
7 problem in our nation and it makes a big impact on
8 what kind of education our students get across the
9 board.

10 DR. FAULKNER: Other questions or comments
11 for the panel?

12 Thank you, Ms. Zimmer. We appreciate your
13 being here.

14 The third testifier is Peggy Akins. Is
15 she available? We have an indication she hasn't
16 checked in, so that's why I'm asking. If that's -- if
17 she's not here, then I think we're complete; right, on
18 those who have signed up.

19 It's going to take the staff about five or
20 so minutes to get the projection system set up. If
21 the Panel wants to take a break briefly they may do
22 so, but the projection system will be set up now. I'm
23 going to ask everybody to turn off their microphones.

24 (Whereupon, the above-entitled matter went
25 off the record at 3:34 p.m., and resumed at 3:43 p.m.)

26 DR. FAULKNER: Okay, let me ask everybody

1 to take the seat please. We're ready to re-start.

2 We're going to be talking about the second
3 common concept. And I'd like to point out to the
4 audience and to the Panel that we have two screens up.
5 They're both carrying the same information. Those in
6 the audience might find it actually somewhat more
7 convenient to rotate your chair and look at the other
8 screen. And we won't be offended if you turn your
9 backs. But anyway, there are two screens. And as I
10 said, as we talk -- they'll both be carrying the same
11 information.

12 Now, let me emphasize again that we're
13 talking only about major elements, findings,
14 recommendations that are in the current concept, and
15 what the panel thinks about those. What we need to
16 find out in this session is the degree to which there
17 is agreement or disagreement on a point so that we can
18 build a catalog of items that are largely settled for
19 inclusion in the report, and another set of items that
20 will require more debate. We're really just trying to
21 sort those things out.

22 This can be a time for suggesting other
23 elements, but I'd say we ought to be careful about
24 that. They need to be significant elements. We can
25 start thinking about that, but we'll also have
26 additional time tomorrow.

1 In general, this is not a time for
2 wordsmithing. I would like to caution the Panel on
3 that. The documents that you have here are cobbled
4 together from documents that the synthesis groups
5 cobbled together from their own language and the
6 working papers of the various task groups and the
7 subcommittee reports. These are really to be
8 suggestive about what might be included in the report.

9 From this document once we settle it, we
10 will build a draft. The draft will be largely made up
11 of language taken from the working papers of the task
12 groups. And that language and the language that is in
13 the task group reports has already received quite a
14 bit of attention from people. And that language is
15 what will be brought into the draft final report once
16 we have the concept settled. So there will be time
17 for wordsmithing later, but it's mostly going to be at
18 our Baltimore meeting in late November when that full
19 text is available to you.

20 Today what we're going to do is take the
21 current concept and we'll go through it section by
22 section. You'll see where we are on the screen.
23 There are also competent note takers and a
24 transcriptionist making sure that everything gets
25 recorded. So we're not going to edit right here on
26 the spot. What we're going to do is receive people's

1 comments, and then from those comments we'll try to
2 make the consequential changes that seem to be
3 appropriate.

4 Let's get started. And we're going to be
5 running until I think 6:00, so we've got about two
6 hours here. That's the start.

7 The second common concept -- to the Panel,
8 I'll remind the members; I spoke a little bit to you
9 earlier -- differs from the first common concept in
10 that you asked for a faster start getting to the more
11 impactful language and getting away from the more
12 operational stuff about how this Panel got charged,
13 and who the members are and where we met, and all
14 that. So let me show you how we have addressed that.

15 You'll see that there's room for an
16 executive summary. That has to be done later. We're
17 not going to worry about that right now. The
18 introductory comments in the first paragraph or two
19 will quickly indicate that this Panel arose from
20 Presidential Executive Order. It'll talk -- it'll at
21 least provide a reference as to where the membership
22 list can be found and then it'll provide a reference
23 on how the panel's work was carried out.

24 Let me ask Sara to scroll down now all the
25 way to the end, control end. There you go. Now
26 scroll up and we'll see that the appendices -- I see

1 that we've got an error already. But anyway, the
2 appendices would be A, the Presidential Executive
3 Order; B, the rosters of the Panel members and staff
4 and consultants; and then C -- that should be a C --
5 is organization and operation of the Panel.

6 And you'll see all the stuff that we had
7 previously laid out: the summary of the Panel's
8 method for pursuing its work, the task groups and
9 subcommittees, the synthesis and submission of this
10 report, the standards of evidence. That's all laid
11 out in Appendix C. And we haven't changed any of the
12 details that are written there. It's simply just
13 where it's arranged. Then D is still the locations
14 and the meetings and dates, and E is the rosters of
15 the task groups and subcommittees. So we moved all
16 that stuff back into the back.

17 Now going back up to the top, we have the
18 case. I think we believe that we need to begin this
19 document with a strong discussion about the state of
20 math education in the country and the need to address
21 this issue, this set of issues. There are -- there's
22 a whole body of material, I think, that we have to get
23 organized into this kind of carefully written
24 argument. The material that was identified up there
25 in the front, the root in the President's charge, the
26 policy behind -- concerns behind the Executive Order

1 having to do with college going rates and college
2 graduation rates and eligibility for the workforce,
3 Gathering Storm and so forth, mathematical performance
4 on international competitions, those are things we've
5 already discussed.

6 What came out of one of the task -- or the
7 synthesis groups this morning was this discussion that
8 you'll see starting with point one there. Sara,
9 scroll that up a little more. And what we did was
10 agreed to put it in the case bin here. I think at
11 this stage we're not really composing this case. We're
12 really just collecting things that look like we ought
13 to think about for inclusion in it. But this argument
14 that begins "Mathematics education has been a major
15 concern for more than 50 years. Wave after wave of
16 improvement efforts have focused on math education,"
17 et cetera. This is stuff that we have put in this as
18 a result of its being developed in the discussion
19 group this morning, or the synthesis group. And
20 I want to open up any comments that people want to
21 make on the case section here relevant to whatever has
22 been put in today or whatever is already there or
23 whatever you think needs to be added into it. Sandra?

24 DR. STOTSKY: Let me just say that I think
25 that up until point four, it seems relatively okay to
26 me. I don't want to do the wordsmithing as you

1 suggested, but my sense is that from five down through
2 the end of that section we've had an abrupt change in
3 what the focus of the panel has actually produced as
4 work. We're suddenly talking about resources, gaps in
5 resources, and making investments, which is about --
6 and most of this is about research that needs to be
7 done and investing in this research, which is really
8 not what I have conceived the work of the Panel to be
9 about.

10 I would say that what I thought we were
11 trying to do was make sure that we had a focus on the
12 content of mathematics, on content goals for K through
13 seven teachers, on properly focused assessments that
14 would address the content of mathematics, on the focus
15 of instruction that would address the content of the
16 classroom, and so on. Somehow that focus on
17 restoring an emphasis on the content of mathematics
18 has been lost, and we're talking about resources and
19 gaps and investments for research. I don't really
20 understand why we need to do this, and I think we need
21 to recast the case that we're making.

22 DR. FAULKNER: Yes. Let me say again, we
23 haven't actually made any decisions on the case.
24 We're just collecting stuff into that box.

25 DR. STOTSKY: Okay.

26 DR. FAULKNER: But I think the comments

1 that you're making are relevant to where we go. And
2 so I invite any comments, and those comments will be
3 annotated into this document. But this doc -- this
4 section differs from any other section in this
5 document in that it's less digested in terms of what a
6 formal presentation would be than the other sections.
7 Yes, go ahead.

8 In fact, let me also point out that the
9 synthesis groups weren't actually asked to address
10 this part of the document. I just indicated that
11 there would have to be such a section when we came
12 together the other day, and indicated that we would
13 have to carefully develop it. But the synthesis
14 groups were actually asked to address more of the
15 content part of the document. And so this has not
16 been developed on the basis of any extensive synthesis
17 group interaction and it's just, as I said, a bin for
18 collecting stuff right now. But I -- so I want to be
19 sure everybody discusses it on that basis.

20 Yes, go ahead, Wilfried.

21 DR. SCHMID: It seems to me that if you
22 look at the section that Sandy is referring to, lines
23 35 through lines 80, the two words that really
24 bothered her are resources and investments. Now I
25 find reading this section that resources is used in
26 this case, in line 35, as a synonym for sources, and

1 investments, on line 76, is really used as a synonym
2 for basis. And using the words resources and
3 investments, respectively, suggests that in section --
4 in the section we are really talking about well, that
5 there's a lot of money, and we're not.

6 So I think the choice of words, resources
7 and investments in these two locations are really out
8 of character with the whole section. This is not a
9 matter of wordsmithing. Those words need to be
10 changed.

11 MR. FAULKNER: Wade, yes.

12 MR. BOYKIN: A couple of comments. One is
13 that, when our synthesis group offered up these
14 particular points, we thought it was important to have
15 them somewhere in the document to help frame the
16 overall message, if you would, that we want to
17 deliver. Where they are placed is up for grabs. It
18 doesn't necessarily have to be in the section on the
19 case to be made, just that this will help to frame
20 some of the comments that we think should come out of
21 this document as it is to be interpreted or processed
22 by the readership.

23 The second thing, and I think more
24 importantly, is that maybe the label is incorrect, but
25 points 5-A, B, C and D are merely summaries of general
26 findings from the body of the report. And the point

1 to be made is that, we sort of know these things, and
2 then in 6 it's like then how do we get these things
3 into the classroom where real kids can receive good
4 instruction from real teachers. I think that's what's
5 the message here. If it's part of the case or not,
6 where you put it is, I think, less consequential than
7 the fact that we think these matters here need to be
8 in the document to help frame our overall statements.

9 DR. FAULKNER: Bert, then Valerie.

10 DR. FRISTEDT: I share Sandy's concerns
11 and Wilfried's concerns. It is true that one wants to
12 sort of catch the full story up front, but in some
13 sense it's also a misleading story that gets
14 represented here about where the main thrust of the
15 document is concerned. I'm particularly concerned
16 about items 5-C and 5-D unless later we have something
17 very concrete to say that we are already making
18 progress in these areas.

19 I think I'll just leave my comments at
20 that, but I'm finding -- I'm essentially in agreement
21 with Sandy.

22 DR. FAULKNER: Valerie?

23 DR. REYNA: The -- one of the tasks that
24 this group had, I think from the beginning, is not
25 only to speak to the content of mathematics that ought
26 to be taught, and policy and practice, but also to

1 recommend research and areas for further research. So
2 I think that's certainly within the purview. The
3 question of the placement of these -- the
4 recommendation section may be a bit odd. Again, I
5 think it has to do with the fact that we were doing
6 this very recently. So if we were to take the
7 recommendations and place them in the context of the
8 other recommendations of the panel, this might flow a
9 bit more smoothly. But I do think that
10 recommendations for research may be among our most
11 valuable contributions of the Panel.

12 DR. FAULKNER: Okay. Anything else on
13 this? Deborah?

14 DR. LOEWENBERG-BALL: What our task group
15 was trying to do, just without respect to the
16 particular words, is that, we worried about what we
17 just heard in testimony. And we've worried about that
18 since the beginning of the Panel's work, and that is
19 how this report will have the impact that we all hoped
20 it could have and how it could make some difference
21 for policy and practice.

22 So what we were talking about today, as we
23 went through these lists of things that we're about to
24 talk about, was we noticed something very interesting,
25 that there's astonishing agreement about one major
26 thing that Sandra just referred to, which is amazing

1 amount of progress has been made and agreement about
2 what kids should learn. There's a huge amount that's
3 going to be in our report about that. There's also
4 amazing progress in our knowledge about how kids
5 learn. So the first section we're saying is that's
6 really astonishing, and we can produce that for the
7 public and for policy makers.

8 One big problem is that, like has happened
9 many times before, what it will take for that to
10 actually reach classrooms and be used by teachers and
11 to be part of real, usable policy has historically
12 always been left in the gap. And we notice that in
13 the research from Instructional Practices and in the
14 research from the Teacher group, for significant parts
15 of what it takes to make these things happen, we still
16 lack knowledge.

17 So we set up, whether it goes at the front
18 or not, we thought we're proposing these -- in fact
19 when we were asked about what are the big points,
20 we're proposing these as the big points. This is what
21 we feel we've learned. And on one hand, two of the
22 task groups were able to collect astonishing progress
23 in two key areas for the improvement of mathematics
24 achievement. Two of the Panel groups, after a lot of
25 work, discovered that we don't actually know all that
26 it will take to make the knowledge about learning and

1 the knowledge about mathematical content reach real
2 classrooms. So try to understand that whether you
3 like the wording or not, that what we're attempting to
4 do is to help our work we've done over the last 18
5 months actually have a punch.

6 I fear, and I think some of the colleagues
7 in my group fear this report, unless we can figure out
8 how to say what it is this group actually found, that
9 we may be relegated to the same shelves that all the
10 prior reports are. And we talked about this before.

11 So be sympathetic about the language,
12 because as Larry said, it's not like it was written
13 with great care. But it -- there is a point being
14 made here about what the five task groups found, and I
15 think it's worthy of our continued discussion, whether
16 we agree that it's amazing the areas we know a lot and
17 the areas where we don't, it's really a problem, and
18 something that's really worth trying to continue to
19 think about.

20 DR. FAULKNER: Wilfried, then Sandy.

21 DR. SCHMID: Just want to make it very
22 clear that what I was talking about were two -- these
23 two particular words, because they suggest a direction
24 that I don't think was intended. And if those words
25 are changed, then this is not -- I am not particularly
26 objecting. I think, you know, I have some agreement

1 with Bert about his comments, but I am really
2 concerned about two words.

3 DR. FAULKNER: Sandy?

4 DR. STOTSKY: I'd like to say that I also
5 am very conscious of how the report will be received.
6 And I would not want another report that seems to say
7 we need more money for research. I don't think that
8 is the way we want us to be seen. And that is what is
9 now being conveyed by all of these four areas for
10 research as the answer to our efforts in order to make
11 more progress.

12 I say that for another reason. Not only
13 because I don't think that that correctly
14 characterizes why the Panel was put into being and
15 what we should be seen in public as saying is the
16 outcome of the Panel, because this is a very common
17 saying. Get a bunch of researchers together and, of
18 course, they're going to say we need more money for
19 more research. This has been known for decades as the
20 common answer you get.

21 There's another reason, and that is we had
22 very poor yield from most of the research we looked
23 at. We talked about this earlier, that most of the
24 research we've looked at has been so poor that we
25 haven't been able to use most of it for any reasons at
26 all. Most of it doesn't even qualify as high quality.

1 Some of it is research that doesn't allow many
2 conclusions to be drawn from it to begin with.

3 So to then advocate more money for
4 something that doesn't even necessarily come out of
5 what we basically were -- was able -- what we were
6 able to use sounds self-serving. And I think that we
7 need to be very careful that we're not self-serving in
8 this document and can somehow say that many of the
9 things we found don't really require money.

10 It's beginning to sound like an old
11 refrain, the best things in life are free. They're
12 not free, but they require an intellectual effort.
13 And they require a way of rethinking about what the
14 purposes of the schools are, what the focus should be
15 and so forth, but they don't necessarily require
16 money. It's a way of changing the way people look at
17 what the purpose of education is and what the purpose
18 of mathematics education should be. And that message
19 is being totally lost by saying we want more money for
20 research.

21 DR. FAULKNER: Wu?

22 DR. WU: So I -- basically I want to
23 compliment something that Deborah said a minute ago,
24 but before saying that let me make one observation,
25 which in part agrees with what Sandy just said. In
26 the words of people other than myself, the impact of

1 mathematics education research or mathematics
2 education itself has been uncertain. And so we -- I
3 think this is something we should keep in mind.

4 But my main message is that, actually,
5 it's amazing that I didn't think of it until Deborah
6 mentioned it a minute ago. In our formulation of our
7 recommendations and in the points of emphasis in our
8 report thus far -- and I think I must confess to
9 having been negligent and missed out on the point that
10 Deborah was trying to make -- which is that the whole
11 point of writing this report is to have an impact.
12 And from that point of view, I mean all the things
13 that we have found to be good, they're really of no
14 use unless we put them into the classroom.

15 And what Deborah is pointing out is that
16 it's the implementation part that maybe we have not
17 been emphasizing enough. For example, because of
18 various aspects of the report from the Teacher Task
19 Group, there have been relatively few statements about
20 teachers in both of our findings and our
21 recommendations. But, in fact, in terms of a lot of
22 what Deborah was saying, how do you carry this to the
23 classroom? And the agent for carrying these out in
24 the classroom is the teacher.

25 And I think we should go back and revamp
26 our recommendations, and I think we need to put a lot

1 of emphasis on how to improve professional
2 development, how to devise better measurements for
3 teachers regarding knowledge, in particular how to
4 devise better methods for preparing knowledgeable
5 teachers. And that, I feel, is -- has been neglected,
6 by myself included. But I think there should be a
7 slight -- maybe major change of direction in the
8 report.

9 DR. FAULKNER: Dave?

10 DR. GEARY: Yes, thank you. I think one
11 of the major reasons that mathematics education has
12 been a concern for the past 50 years is because of the
13 poor research base. In order for us to know what is
14 going to effectively work or not work and how to
15 implement that, we have to have systems in place to
16 evaluate and test out different types of approaches to
17 instruction or learning, whatever the case might be.
18 If we back away from a research base, we're backing
19 away from a scientific base that we're trying to put
20 the field on. And so that needs -- that can't be
21 lost. Otherwise we're back to where we started.

22 DR. FAULKNER: Yes. I might add, Dave,
23 that the President's Executive Order actually includes
24 item P, needs for research in support of mathematics
25 education. So we have an explicit charge to address
26 the research base. And in fact we do; there's a set

1 of recommendations that relate to that.

2 Let me hasten to point out that this is
3 the least digested and least developed part of this
4 report. As long as everybody has thrown their
5 reactions into the pot, that may be the best we can
6 do. If there are some additional comments that people
7 want to make we'll take them, but I'm going to cut off
8 this debate here in a couple of minutes and move on.
9 So we'll take Skip and we'll take Tom.

10 DR. FENNEL: Thanks, Larry. Just a
11 general comment. I appreciate what both Deborah and
12 Wu said, because I do think this piece of the case has
13 punch. I do think it sets up the report. I agree
14 with Wilfried that we can change a couple words and
15 not have it be read as more money for this, more money
16 for that, even though I think that the notion of the
17 need for research, like it or not, down the road will
18 be suggestive of funding in one way or the other. I
19 just value this particular aspect of the report
20 setting up the full report.

21 DR. FAULKNER: Tom?

22 DR. LOVELESS: Thank you. I also agree
23 with what Deborah said and I think there needs to be
24 something in the case. However, the case has to be
25 very punchy. You want to grab the reader. It's a
26 statement of the problem. Why was this Panel created?

1 And so, some of what has been put in after number 4,
2 to me -- for instance, the recommendation at the end
3 has no place for recommendations. They'll come --
4 those should come later in the report. There's no
5 basis yet.

6 But so what I would recommend is a number
7 5 that somehow makes the point that we've made
8 progress on how kids learn math, we've made progress
9 on the mathematics they need to learn, but there's
10 this huge gap getting that kind of knowledge into the
11 classroom. And I think a single statement like that
12 hopefully would capture what Deborah's talking about.

13 DR. FAULKNER: Okay. Can we raise the
14 flag of truce?

15 Okay. Now let's go to the content of
16 school algebra and critical foundations for it. This
17 actually, for the benefit of the audience, is actually
18 the starting point for the place where the task -- the
19 synthesis groups were asked to develop material. And
20 so I think they've spent a lot of time thinking about
21 this material and we can go ahead and talk.

22 Let me set the stage simply by mentioning
23 for the Panel that earlier this morning in the first
24 common concept, you'll remember that this started with
25 the major topics of school algebra. The reaction we
26 got back from the Siegler Group, right? Yes. Was

1 that it would be a good idea to bring forward the
2 critical foundations to match up to the major topics
3 of school algebra, and to also possibly bring the
4 benchmarks forward.

5 As we talked about it at lunchtime, we
6 developed a concept that was a little different from
7 that. It was in agreement with the idea of bringing
8 forward the critical foundations in a kind of
9 foreshadowing way and let them be discussed more
10 substantively in conjunction with learning in the
11 learning section, but go ahead and present the package
12 early. We actually left the benchmarks down in the
13 learning section because they seemed better placed
14 down there. But that's the way this has been shaped,
15 and I think it's time for us to discuss it.

16 So let me suggest that we go ahead and
17 discuss everything in this section called The Content
18 of School Algebra and Critical Foundations for It,
19 which goes down to the subhead "In acquiring
20 knowledge" -- down to the major head "Acquiring
21 Knowledge and Skills Needed to Learn Algebra," or
22 lines 81 to 108. Bert, then Tom.

23 DR. FRISTEDT: I think this is good. And
24 I want to call attention to the fact that, on line 97
25 and on line 107 both, we are actually thinking of a
26 table, the table where the -- those tables might

1 actually be full-page tables, I think, when they're
2 drawn out, or close to it. So that much I like.

3 One thing that I think we have to deal
4 with somewhere, and I was hoping it would be right
5 here, is what does the word algebra mean. Because of
6 the fact that the National Assessment of Education
7 Progress (NAEP), at least until recently, has algebra
8 -- an algebra strand as low as fourth grade. And
9 that's not what is being discussed here as algebra.
10 And we do need some clarification there, and I think
11 we can't keep talking about algebra when different
12 people have vastly different interpretations of what
13 the word means.

14 DR. FAULKNER: Well, we did discuss what
15 is the identity of school algebra, but now you want to
16 get to the etymology.

17 DR. FRISTEDT: I want to get to a little
18 more -- and a good criterion in my mind is ratio and
19 proportion, is that part of the material that precedes
20 algebra or is it part of algebra? If we nail that, we
21 will have done a pretty good job of saying what
22 algebra is.

23 DR. FAULKNER: Okay. Thank you, Bert.
24 Tom?

25 DR. LOVELESS: Thank you again. I want to
26 press this case, bringing the benchmarks up to the top

1 and putting them right after the critical foundations.
2 And the reasoning -- and I apologize to my task group
3 members who have already heard this argument so
4 they're going to hear me repeat it again. The reason
5 is that one of the major flaws of math education in my
6 own view in the 20th century has been a confounding of
7 process and content. And --

8 DR. FAULKNER: Confounding of process --

9 DR. LOVELESS: Of process and content.

10 DR. FAULKNER: Content, thank you.

11 DR. LOVELESS: And I think a reader of our
12 document, first of all, they will see the question
13 answered, what is algebra. And that's very
14 specifically delineated with the bullets that you see
15 there and everyone can understand what algebra is.

16 The next paragraph, the critical
17 foundations of algebra, is just kind of a squishy
18 paragraph. It doesn't -- I'd rather see five bullets
19 or six bullets that lay out the content. Under that
20 it says there's going to be a table or a chart. And I
21 am sure that I'll be relieved once that's there, but I
22 won't be totally relieved because what the benchmarks
23 tell the public is in addition to -- this is the
24 content, here's why it's taught. At the end of third
25 grade, with a rough idea their kids should know this,
26 and at the end of fifth grade they should know this.

1 So the content stuff needs to be together, and it
2 needs to be focused and it needs to be at the top.

3 Another problem is if the reader reads the
4 phrase "Acquiring the knowledge and skills needed to
5 learn algebra" and then thinks in this section I will
6 find the critical skills needed to learn algebra,
7 unfortunately they will find some other skills. For
8 instance, estimation is talked about in this section,
9 but it's not part of our critical skills and
10 knowledge. And that's because the group that wrote
11 this part talked about the broad base of learning
12 mathematics. They talked about topics other than
13 critical skills.

14 And that's quite right and I think it
15 belongs in there, but we don't want the readers to
16 think that we're contradicting ourselves. If we don't
17 have estimation and rounding and other thing --
18 aspects of mathematics as the critical foundations of
19 algebra, then why are we talking about it under the
20 heading Acquiring Critical Knowledge and Skills?

21 DR. FAULKNER: Tom, let me interject
22 something here. I think you were talking about the
23 squishy paragraph. What, since I'm going to end up
24 constructing a lot of this document, the draft, from
25 the working papers, I will tell you that what I would
26 have in mind in presenting the critical foundations is

1 to present the three paragraph long subsection -- or
2 sections, those three paragraphs that actually deal
3 with whole numbers, fractions, and geometry and
4 measurement. And they're pretty explicit about what's
5 being sought. So there would be more substance than
6 just this little descriptor that's been written for
7 this catalog. Okay?

8 DR. LOVELESS: Okay. And again, the logic
9 of the reader encountering this document for the first
10 time, now that I know what it is kids should know to
11 be prepared for algebra -- and it's been put on the
12 same level of importance as what is algebra, on the
13 same level of detail. My next question is when should
14 -- when are they taught this in the school experience
15 of K through eight.

16 DR. FAULKNER: Well, I --

17 DR. LOVELESS: That's why I --

18 DR. FAULKNER: No, I think your point that
19 it goes immediately to the question of implementation
20 is a good point. And that's one that I think is worth
21 having a discussion about here today. Skip.

22 DR. FENNELL: Well, we discussed this a
23 lot. And I agree with Tom, I think it sets it up.
24 The target here -- here's the mathematics target,
25 algebra, and here's how we're defining algebra, and
26 here's the mathematics, the subset of what kinds of

1 mathematics to do prior to courses in algebra that
2 directly relates to algebra. And oh, by the way, this
3 is when they should learn it.

4 So I think it sets the stage nicely for
5 then the discussion of the learning content related
6 section that would follow.

7 DR. FAULKNER: Wilfried?

8 DR. SCHMID: The benchmarks, I think, were
9 purposely and advisedly kept extremely spare. They
10 were meant as really guideposts. And for that reason,
11 since it's really a rather short passage, I do agree
12 with Tom and Skip that it really makes sense to have
13 that right there. It is an integral part of talking
14 about the critical foundations.

15 I mean the critical foundations, the
16 substance cannot be entirely separated from the idea
17 of roughly when various things have to be done.
18 Certainly we have seen cases when things that should
19 be done at third grade are postponed until sixth
20 grade. And so to have a rough guidepost does make
21 sense, really as part of the critical foundations.
22 And especially because it is so compact, I think it
23 should go with the critical foundations.

24 DR. FAULKNER: I'm hearing a fair amount
25 of convergence on that. Does anybody have an opposite
26 view? I don't think anybody who was sitting around at

1 lunch would have a really strong opinion about keeping
2 it down in the learning.

3 I -- my reason for putting it down in the
4 learning was largely to get to the -- get through the
5 early presentation of the most important elements,
6 major topics and the critical foundations without
7 cluttering this list, but I think -- but I buy your
8 argument. So I think we'll go ahead and agree that
9 that's done. All right? Liping?

10 DR. MA: I don't know if I'm repeating
11 something or not, but we used to raise this point of
12 two algebras that now we kind of have in math
13 education. Are we going to address this?

14 DR. FAULKNER: Go ahead and address it.

15 DR. MA: It's just like we have -- what
16 kind of algebra are we are talking here? But actually
17 now in elementary schools they are teaching algebra,
18 which is not this algebra, not formal algebra, not
19 symbolic algebra. But they use the same words.

20 DR. FAULKNER: Well, that gets at what
21 Bert was raising.

22 DR. MA: Yes.

23 DR. FAULKNER: Unless I'm mistaken that's

24 --

25 DR. MA: Are we going to say --

26 DR. FAULKNER: -- the same question.

1 DR. MA: -- specifically, clearly saying
2 that -- because I'm concerned that if we don't say it
3 clearly then people will tend to confuse the two
4 algebras, like replace that algebra with this algebra.
5 I don't know if I make sense, clear or not. I --

6 DR. FAULKNER: All right. Well, there's a
7 whole series of -- I mean these two questions that --
8 your question is very relatable to what Bert raised.
9 Are there comments people want to make about what to
10 do about that? Skip?

11 DR. FENNEL: I'll just respond to that a
12 bit, that the -- we have discussed this opinion in a
13 number of places. In the assessment of task group
14 work we actually quote Hy Bass' definition and talk
15 about the concerns with regard to, if you will, over
16 emphasis of patterns in assessments, particularly
17 national assessments, particularly the National
18 Assessment of Education Progress (NAEP) , and use a
19 direct reference to his definition of algebra.

20 Within our work, a lot of elements of the
21 critical foundations within fractions some people
22 refer to as algebra. We have been very specific about
23 talking about ratio and proportion in particular as
24 fitting into that cluster of critical foundations and
25 not calling that algebra, as just a for instance.

26 DR. MA: Yes. I understand we are very

1 clear about that, but if we don't make it clear that
2 this might be misunderstood. Then -- yes, I don't
3 know. I just want to point out my --

4 DR. FAULKNER: Okay.

5 DR. MA: -- concern.

6 DR. FAULKNER: Vern?

7 MR. WILLIAMS: I'd like to follow that up.

8 One thing that has happened is people will recall
9 pattern recognition studied in second grade algebra.
10 And since the world seems to be obsessed with algebra
11 at the moment, even though that's not real algebra
12 it's -- they get away with doing it because who could
13 be against algebra in second grade.

14 And maybe if we could get across what real
15 algebra is, not just in our definition of it starting
16 in I guess around grade eight or nine, but throughout
17 K-8. Maybe we need to make a strong definition,
18 period.

19 DR. FAULKNER: Bert?

20 DR. FRISTEDT: I think it is important to
21 deal with this issue quite explicitly, because we can
22 have internal agreement here, but there are so many
23 readers out there. Now I know one direction I would
24 like to go, but then Skip pointed out a difficulty
25 with that that I fully acknowledge. I'd like to bring
26 the word arithmetic back into use more. But Skip has

1 pointed out to me, and I think correctly so, that
2 arithmetic when it's used by itself tends to just
3 focus on calculation facility, not say on the number
4 line and other aspects of number. So I agree, he's
5 right on that.

6 But I think we have to handle the language
7 issue. I mean we're talking about major issue here is
8 preparation for algebra, and I think we just have to
9 be quite clear and up front, and at least tell people
10 where -- how we are using the words.

11 DR. FAULKNER: Wilfried?

12 DR. SCHMID: In the Conceptual Knowledge
13 and Skills (CKS) report in fact there is at least some
14 effort to do that. And some of the maybe not totally
15 satisfactory mechanisms we use there can find their
16 way into this. For example, there is, what may seem
17 rather superficial, a capitalization of algebra. And
18 in the Conceptual Knowledge and Skills (CKS) report
19 there's a footnote that we use the word algebra with a
20 capital in the sense of the material that is, you
21 know, customarily taught in an algebra course. And so
22 by that device alone we are setting up a certain
23 separation. And I suggest, for example, at least that
24 footnote, maybe more, should make it into this report.

25 DR. FAULKNER: Okay. Other items on this
26 major subhead. I'm hearing a lot of agreement on

1 where we go, but some discussion on the definition.
2 But moving the benchmarks up is something that seems
3 to have been agreed upon.

4 Okay, that takes us into the next section.

5 The next section is acquiring knowledge and skills
6 needed to learn algebra. There are actually two
7 competing concepts of this. And I'd like to present
8 them, I think just lay them out is really probably the
9 right way to say it.

10 The one that you have here is essentially
11 the one that was in the first common concept, although
12 -- that's the one that's in your printed document -- ,
13 although the stand alone recommendations that came
14 from the Wu group got moved to the recommendations
15 section, the critical foundations got moved out of
16 this and moved up. The benchmarks are still in this
17 but will now depart. So there are a few changes, but
18 essentially it's the one you saw this morning. There
19 are not -- there's not a lot that has been changed
20 here, probably nothing substantive. Geometry and --
21 was changed to geometry and measurement in the fifth
22 header because that's what we've been using elsewhere.
23 And I think that's pretty much it.

24 So that's that layout. It begins with
25 readiness for learning and what children bring to
26 school, and a lot of that sort of thing that was

1 emphasized in the learning processes report. And we
2 have an alternate concept for this that came out of
3 Doug's synthesis group. And what I think I'll do is
4 we're going to throw that one up on the screen and
5 Doug can tell us what's different about it. Okay.

6 DR. CLEMENTS: What we looked at when we
7 looked at the -- readiness for learning used to be the
8 number one, right? That is the number one in the
9 version you all have in your hands. And the -- two
10 things struck us when we looked at that.

11 Number one was there were a couple of
12 statements that were embedded in the readiness to
13 learn on arithmetic facts and procedures and the like
14 that were -- for instance, C there, the interplay of
15 conceptual and procedural knowledge, that were very
16 important, right on, but general. In other words,
17 they didn't just apply to addition and subtraction;
18 they didn't just apply to this. They're general
19 psychological principles that apply to all mathematics
20 learning. So we felt why not have that be up at the
21 beginning.

22 Then there was -- there were other cases,
23 such as -- if you would scroll down for us just a
24 little bit here. Other cases such as -- right there
25 is fine -- E, attitudes, beliefs, motivation and other
26 things that were just not emphasized in the present

1 concept paper, in concept paper number one, stereotype
2 threat and the like or others, that some people in our
3 synthesis group thought were important points to be
4 added. They were also general. Therefore, we came up
5 with the idea that maybe before the readiness to learn
6 we could make some of these general statements about
7 learning. And then we edited down but did not
8 eliminate the points as they were realized within the
9 individual content areas.

10 So that's about it. It's a --

11 DR. FAULKNER: Well --

12 DR. CLEMENTS: -- additional section. Is
13 there more to --

14 DR. FAULKNER: Well, I think it helps for
15 you to page all the way through so people can look at
16 the structure.

17 DR. CLEMENTS: Oh.

18 DR. FAULKNER: And they can see what's
19 deleted --

20 DR. CLEMENTS: Fine, fine, fine.

21 DR. FAULKNER: -- and narrowed it down --

22 DR. CLEMENTS: Let's keep going down then.

23 DR. FAULKNER: -- and so on.

24 DR. CLEMENTS: So these are some general
25 issues, including social, emotional, affective issues
26 --

1 DR. FAULKNER: That's right, yes, you
2 brought the social and motivational --

3 DR. CLEMENTS: And we moved that up here.
4 That's not an addition. That's just something that
5 was moved, and really was out of place where it was in
6 that paper. This gives it a home here that it really
7 didn't have because it was just kind of stuck on later
8 in the paper.

9 If you keep scrolling down we can at least
10 get to an example of --

11 DR. FAULKNER: Yes.

12 DR. CLEMENTS: -- for instance, B --

13 DR. FAULKNER: This is where you pick up
14 the beginning of --

15 DR. CLEMENTS: Exactly. B is just moved
16 up. That's it. It's -- not a word has been changed.
17 It's just a move because this is really a general
18 kind of learning process result. Keep going down.
19 And I think I'll go down a little farther into whole
20 number arithmetic.

21 And you'll see there B is a good -- A,
22 first of all, is generally stated up above and it
23 really isn't just for -- to prepare students for
24 algebra. It's just -- the whole curriculum should do
25 that so we've made it a general statement. We agree
26 with it completely.

1 And then B gives you an example of how we kept
2 the principle and just removed that material that was
3 redundant with the general statement of the principle
4 up in the proposed new section.

5 DR. FAULKNER: And then as you --

6 DR. CLEMENTS: Is that enough?

7 DR. FAULKNER: Keep going down. I think
8 everybody should have a chance to just kind of survey
9 it. So just keep paging down.

10 DR. CLEMENTS: I don't think --

11 DR. FAULKNER: And see less and less has
12 changed.

13 DR. CLEMENTS: Yes, I don't think there
14 were that many other changes actually --

15 DR. FAULKNER: Right.

16 DR. CLEMENTS: -- that were relevant to
17 this particular point.

18 DR. FENNEL: Can we go all the way to the
19 start and see how it sets up now that we get the sense
20 of what's going on?

21 DR. FAULKNER: What do you want to do?

22 DR. FENNEL: Can we go all the way to the
23 start of this insertion to see how it's set up?

24 MS. FLAWN: The principles.

25 DR. FAULKNER: The beginning.

26 DR. FENNEL: (Indiscernible) insertions,

1 right there.

2 DR. FAULKNER: Right there, okay.

3 DR. FENNELL: So that would replace --

4 DR. CLEMENTS: No.

5 DR. FAULKNER: No. It's an add-on.

6 DR. CLEMENTS: (Indiscernible).

7 DR. FENNELL: Where did you get this?

8 DR. CLEMENTS: From the general
9 principles . . .

10 DR. REYNA: We took them out of
11 subsections.

12 MR. WILLIAMS: This would come before line
13 110?

14 DR. REYNA: Yes.

15 DR. FAULKNER: Amazingly they picked these
16 points, the general points up out of other sections
17 and moved them up.

18 DR. CLEMENTS: Exactly.

19 DR. FAULKNER: Wilfried?

20 DR. SCHMID: I am really not happy with
21 that suggestion. I mean I think that the way this
22 existing document is structured, it really tries to
23 get as quickly as possible to let's say the issues of
24 content. And at least to me, there is great symbolic
25 importance to the fact that the content comes very
26 early and that it is separated from these issues.

1 I don't -- do not say that these issues
2 are not important. They are, of course, very
3 appropriate content for our report. But I would
4 rather not dilute the focus on content and the
5 separation of content issues from these issues. I
6 think that Tom has made a very strong case that some
7 of the -- quite a few of the troubles of American
8 education in fact have come from too great an
9 amalgamation of the issue of content and learning
10 mechanisms.

11 DR. FAULKNER: Are there commentators on
12 this? Tom?

13 DR. LOVELESS: I just wanted to ask Doug a
14 question. What would -- what's the main benefit from
15 doing it this way? What's -- what do we gain?

16 DR. CLEMENTS: I would defer to some of
17 the others who weighed, I'd like -- and I'd like you
18 to weigh in because this was primarily your notion.
19 So -- although I typed them in.

20 But I think it was just that we kept
21 seeing these things interspersed in the different
22 areas but they made general points. And so part of it
23 was just to make those general points. But I think
24 almost more -- perhaps more importantly to people were
25 the areas such as -- that I pointed out before that
26 just weren't in the report.

1 So people were making a statement about
2 essential learning principles, motivation and things
3 like that that weren't present at all. And so if you
4 don't put them in a general point, those things seemed
5 to not have a home at all. It made the -- you show
6 the principles --

7 DR. FAULKNER: Is it thinkable to take the
8 approach that exists on paper here and go to those
9 points and simply be explicit about the fact that when
10 you reach those points, even though they're discussed
11 in a local setting, to make the point that they are
12 general? In other words, declare the generality but
13 in context. That's an alternative that I can mention.
14 Let's go to Wu and then to Wade.

15 DR. WU: I like to just add my -- not
16 really objection. I guess it's an objection. I
17 prefer the original approach to this one. I think if
18 you have an elaborate presentation of the general
19 theory of learning and how mathematics, learning of
20 algebra fits into this context, that would be the
21 right way to do it. And so I think, for example, the
22 learning group document if your notes can do it this
23 way and double emphasize certain things that people
24 want to emphasize.

25 But you'll have a short document that will
26 try to be as impactful as possible, get to the heart

1 of the matter within the shortest time. And I think
2 the word that Wilfried uses is very good, but by doing
3 it this way you dilute the message. And so I just
4 want to add to my previous preference.

5 DR. FAULKNER: Wade, then Russ, then
6 Valerie.

7 DR. BOYKIN: Yes. If you look at the
8 three original synthesis documents, two of the three
9 have sections that essentially said how students
10 learn, how students learn mathematics, how do students
11 learn. And in those sections you did get issues
12 around learning and learning processes that
13 transcended any particular content area of
14 mathematics. And we felt -- and that got lost in the
15 end of the first concept paper and so we thought it
16 needed to have a life of its own.

17 Frankly, I think it's less important, to
18 me at least, whether it's up front before we go
19 through the content areas or after it. It just needs
20 to be here because when you get things like issues of
21 authenticity into one content area, or things around
22 conception and specific knowledge into one content
23 area it sort of misrepresents the reality that these
24 are generic processes that would enhance or be
25 involved in whether it's geometry or algebra, whatever
26 the case may be.

1 The other point that I think is critical
2 is that when you get to some of the collateral
3 processes of learning, such as the socio-emotional
4 matters, or issues of equity as mentioned by
5 testimony today, issues around, as the charge was
6 given to us, how children from different backgrounds
7 learn mathematics, issues around ethnic and racial
8 differences in learning mathematics in the mix, those
9 are also matters that transcend particular topics in
10 math per se and deserve a home in the document, and
11 simply are not in the version of document we have
12 right now. And it seemed to make sense, those reasons
13 alone, that somewhere in this document, before we get
14 too far into it, that we address these general issues
15 and issues of equity and issues around socio-emotional
16 processes in the mix.

17 DR. FAULKNER: Russ?

18 DR. WHITEHURST: I probably agree with
19 what's being suggested, but I'm frustrated --

20 DR. FAULKNER: Wait. What -- which one is
21 what you are agreeing with?

22 DR. WHITEHURST: I agree with -- is this
23 on?

24 DR. FAULKNER: You're sure it's on?

25 DR. WHITEHURST: I believe I may -- can
26 you hear me now?

1 DR. FAULKNER: Yes, much better.

2 DR. WHITEHURST: Okay. I believe I may
3 agree with what's being suggested, but I'm frustrated
4 at being asked to agree to something that I haven't
5 read and can't read except by scrolling down the
6 screen. Is there a paper version of this we might
7 look at so that we can do a quick side by side and
8 know exactly what's being proposed?

9 DR. FAULKNER: I think --

10 MS. FLAWN: We'll see if we can do that.

11 DR. FAULKNER: We don't have a paper
12 version right at the moment.

13 Valerie, you want to go ahead.

14 DS. REYNA: Yes. I -- those three that,
15 for example, are on the board, I agree with Wade that
16 the -- I would say that the -- it's fine that the
17 content be emphasized first for the reasons that
18 people have mentioned, I think that's a fine thing to
19 do.

20 I agree with Wade, however, that diluting
21 them by -- these issues by putting them within
22 different subheadings would be a mistake. The three
23 that we're looking at right now, for example, and
24 there are others, directly bare on important policy
25 issues that are currently framing not only research,
26 but practice. So the first one, A, is the sort of

1 motivation that motivated -- that created programs
2 such as HeadStart. The fact that the preparation for
3 algebra extends back into the preschool area is news
4 in some quarters and will directly affect the way we
5 make policy.

6 The interplay between conceptual and
7 procedural knowledge is a theme that we've talked
8 about that, again, bears on things where people have
9 said there's a false dichotomy here and which they
10 want to stress one over the other. This really
11 influences practice, it influences research. And so
12 to dilute it by putting it within subheadings I think
13 would be a mistake.

14 DR. FAULKNER: Bob?

15 DR. SIEGLER: Yes. The original creation
16 of the document that's on paper reflects an effort on
17 the part of the synthesis group I to integrate the
18 Conceptual Knowledge and Skills (CKS) and Learning
19 Processes (LP) themes. And the reason for not having
20 this learning material up front stemmed from the logic
21 of trying to implement that. Now before we move away
22 from that effort, we've decided to have the major
23 part, not all of the part, but a lot of the part of
24 the content of algebra up front and separate from the
25 learning material.

26 And so at this point, I think that having

1 these learning themes up front actually makes a lot of
2 sense. We're not talking about a lot of space here.
3 We're talking about something that probably wouldn't
4 be much longer in a written report than what we're
5 seeing on the screen.

6 And what Vern and Wade and others have
7 said is absolutely correct, that these are themes that
8 logically transcend any particular content area. So
9 that on a logical basis, I think there's a great deal
10 to be said for this organization. And in the end, I
11 actually found it decisive. I prefer this
12 organization to the original one.

13 DR. FAULKNER: Let me suggest a path that
14 I think actually is probably a better path than trying
15 to just address this in this form. I don't think it
16 would take all that much additional work to actually
17 draft both the sections so that you could see what
18 they would look like in real text and comparable text.
19 And I think we could address the order on the basis of
20 the real drafts rather than on the basis of these
21 outlines. If you prefer, I think that's the path we
22 can go ahead and take and just present you with two
23 alternates. Bert?

24 DR. FRISTEDT: I agree to that, but I do
25 want to point out that because of the different ways
26 that different task groups sort of carried out their

1 responsibilities, we get a very different perception
2 of how much space different things are taking.
3 Learning Processes has these sort of short commands,
4 one after the other. Actually I don't like that
5 language so much; it's too commanding. But a lot of
6 their things can be combined into one nice little
7 paragraph. Actually, it wouldn't be a very long
8 paragraph.

9 And so I think part of the trouble in
10 deciding how things are organized is back here for
11 critical foundations of algebra there's one line that
12 says we're going to have a big figure. Over here when
13 we come to learning processes every little sentence is
14 practically there. And I -- it just makes it --

15 DR. FAULKNER: Well, that's just the way
16 it is. And --

17 DR. FRISTEDT: But anyway, I want --

18 DR. FAULKNER: That's -- and I agree. I
19 think that you can't always get a good picture of how
20 long this would be and how oppressive it would be, and
21 how much delay you're going to feel in getting to the
22 algebra specific content.

23 And I think the only way to address that
24 is simply to compare the two texts and see where we
25 are. I don't think it will be that hard. I mean for
26 the most part, this is a rearrangement. It's not a --

1 two completely different projects.

2 DR. FAULKNER: Okay, Vern.

3 MR. WILLIAMS: Wade, you had mentioned the
4 thing about equity. And one problem in the past has
5 been different learning styles, some of which I
6 believe and some of which I don't as far as involving
7 minorities. But one thing that we can all agree on is
8 the content. I don't think we're ever going to agree
9 on the learning processes and the equity issues, or we
10 may as a Panel, but I don't think the general public
11 will. So I think our number one effort should be
12 content, because regardless of your beliefs about
13 gender or race or anything else, there shouldn't be a
14 problem with this as to the content that every kid
15 should learn and every kid should prepare themselves
16 for an algebra course.

17 DR. FAULKNER: Wade?

18 DR. BOYKIN: Yes, I certainly share you're
19 sensitivity about trying to leave out of this issues
20 of ideology or beliefs and whether there are or are
21 not learning styles per se. What we did in this
22 section certainly is to let the data speak for itself.
23 And it wasn't so much that from the data it said that
24 this learning style is present in Hispanic children,
25 this one's in black kids per se.

26 It did point out that although there

1 really are a lot more similarities than differences,
2 there are some areas where -- that if these are
3 emphasized more, issues around mastery versus
4 performance limitation, issues around focusing on
5 effort, having kids to see effort as the driving force
6 as opposed to ability, there is solid data -- I don't
7 say that it's conclusive, but it's suggestive that
8 these kinds of things are important places to look
9 when you want to pursue matters of equity. And again,
10 it's the research findings that drive these comments
11 as opposed to beliefs or ideologies.

12 DR. FAULKNER: Wilfried?

13 DR. SCHMID: Well, first of all, I should
14 say that of course, you know, after this presentation
15 I do agree that it makes sense to have all of these
16 issues together. So that I -- what I said before
17 should not be seen as arguing against that. That
18 makes a lot of sense.

19 But then I would say that let's say the
20 way you described what you just did, that there is,
21 you know, there is evidence, you say. But I think you
22 did agree in effect with Vern, that while there is
23 agreement, it is not on the same level as the kind of
24 agreement we have on content. And so therefore,
25 perhaps let the content speak for itself and then we
26 talk about these other issues, which are important and

1 they need to be addressed. And they need to be
2 addressed together. But I would rather not have,
3 let's say, the focus on content interrupted by this
4 particular section.

5 DR. BOYKIN: I concur.

6 DR. FAULKNER: Skip, did you have your
7 hand up earlier?

8 DR. FENNELL: Yes, I did, because I
9 thought Val and Bob made a really good suggestion to
10 use these general principles to -- of learning -- to
11 frame. And I was struck by if it's only A, B and C
12 that would ease this pretty nicely into the further
13 discussion. I then asked Doug to scroll down and let
14 me look at the rest of it and it's a heck of a lot
15 more.

16 So we -- I think, Larry, your thought of
17 let's look at two side by side and we see -- we can
18 see how it lays out. And we could also -- there's
19 always the option of sort of preserving parts of the
20 general principles, but perhaps not all of them,
21 because in fact they did exist somewhere else until a
22 couple hours ago. But I -- but the cases for
23 particularly A, B and C there I think were very well
24 presented by Val.

25 DR. BENBOW: One version, we could just
26 take these general principles and put them at the end

1 instead of at the beginning. So it's a summing up,
2 rather than a framing it could be a summing up. And
3 then we could talk about there are these general
4 principles that cut across these topics that we had.
5 So that could be another version that we could look at
6 to see which one makes the most sense to us.

7 DR. REYNA: Put it at the end.

8 DR. BENBOW: At the end of the content
9 things, not at the end of the document?

10 DR. REYNA: Yes, right. End of -- yes.

11 DR. BENBOW: Yes.

12 DR. CLEMENTS: And that's how they were in
13 the original --

14 DR. REYNA: Yes.

15 DR. CLEMENTS: -- concept paper.

16 DR. BENBOW: Oh, okay.

17 DR. CLEMENTS: -- of our group.

18 DR. BENBOW: We're back to where we
19 started.

20 DR. CLEMENTS: Exactly.

21 DR. FAULKNER: Tom, Wilfried.

22 DR. LOVELESS: You know, maybe what we
23 should do -- this is just a suggestion, would be to
24 table this. I think everybody agrees this is the
25 right content, it's where to place it. And I don't
26 think I can make a decision about that unless I see it

1 on paper. I have a hard time with --

2 DR. FAULKNER: Old guys.

3 DR. LOVELESS: -- with track changing. So
4 maybe we can discuss this tomorrow. Is that possible?

5 And move on to other things and --

6 DR. FAULKNER: I'm not sure we're going to
7 get any further on this until people can actually see
8 the text.

9 DR. LOVELESS: Well, what I'm saying is
10 tomorrow we could have -- I'm assuming we could copy
11 it, and we could have the two versions.

12 DR. FAULKNER: Well, you can have these
13 two outlines.

14 DR. LOVELESS: Well, even that would be
15 helpful for me.

16 DR. FAULKNER: Okay. Well, Tyrrell says
17 you'll have that in a few minutes.

18 DR. SCHMID: Well, but I -- it seems to me
19 though that we do have some degree of convergence,
20 don't we? I mean I think that Wade felt it was very
21 important to, let's say, preserve the integrity of
22 these particular issues. And I fully agree with that.

23 It seems to me Wade agreed also that it makes sense
24 to have that not interrupt the discussion of content
25 and I see then no conflict.

26 DR. BOYKIN: From my standpoint,

1 extracting these principles into its own section is
2 what I'm arguing for. A, B; B, A. You pay your
3 money, take your choice.

4 DR. CLEMENTS: That's what I'm saying.
5 There seems to be a consensus to just move this
6 section to the end of the contents section and let's -
7 - we could move on without having to compare versions.

8 DR. FAULKNER: You aren't going to get any
9 representational saving doing that, Doug. You're
10 going to end up having to treat, oh, let's say the
11 automaticity thing, practice, into long-term memory.
12 That item you're going to end up treating in specific
13 context --

14 MR. WILLIAMS: That's exactly right.

15 DR. FAULKNER: And then you're going to
16 treat it again --

17 UNIDENTIFIED SPEAKER: But that's okay --

18 UNIDENTIFIED SPEAKER: That's okay.

19 DR. FAULKNER: -- later.

20 UNIDENTIFIED SPEAKER: That's okay.

21 (Simultaneous conversation.)

22 DR. SIEGLER: But you have to admit
23 automaticity -- automaticity is a huge issue when it
24 comes to whole number operations. It's not a huge
25 issue when it comes to fractions or geometry. So that
26 it's not altogether bad to arrange it that way.

1 DR. FAULKNER: Right, but the efficiency
2 of this paper is going to matter.

3 DR. SCHMID: I mean I think that this
4 whole -- I mean I think that Bob had it exactly right.
5 I mean I think that yes, when we talk about
6 automaticity in particular, there is an issue that
7 cuts across subjects.

8 But with automaticity of number facts,
9 there is a really qualitatively different weight to
10 that. And to have let's say that particular issue
11 mentioned twice, first in the context of memorizing
12 number facts, let's use the word automaticity , and
13 then again as a general principle, I see absolutely
14 no problem with that. That makes perfect sense to me.

15
16 DR. FAULKNER: Okay. So what I'm hearing
17 you say is that you want to move -- if we take the
18 version of this paper that Doug's group has put there,
19 you're talking about taking that first section and
20 moving it to the end of --

21 DR. REYNA: The content area.

22 DR. CLEMENTS: Of the content -- right
23 after benchmarks.

24 DR. FAULKNER: Right after benchmarks?

25 DR. REYNA: Right after the old
26 benchmarks.

1 DR. FAULKNER: And then leaving social,
2 motivational and affective where -- after that?

3 (Simultaneous conversation.)

4 DR. BENBOW: That's already up there.

5 DR. FAULKNER: No, but in the Clements'
6 version it's moved way up. It's --

7 (Simultaneous conversation)

8 DR. FAULKNER: It goes back to its old
9 position, okay. All right. So your --

10 DR. FENNEL: But I think the suggestion
11 is to move it there, Larry, for now and then allow for
12 some of the more aged readers -- that would include
13 myself -- the opportunity to look at it, because I
14 think that that section, while I agree very much with
15 many of the principles, general principles there, once
16 we read it we may decide that -- to move them
17 elsewhere. But for right now, I would like to see
18 that done and take a look at it.

19 DR. FAULKNER: Okay.

20 DR. FENNEL: My opinion only.

21 DR. FAULKNER: Okay. All right. If we
22 have a deal, I think I'm going to --

23 All right. Then let's go ahead. What
24 we're going to do now is actually start talking --
25 let's go back to the version we've got here. Well,
26 actually let's go back to the version there.

1 What we're going to need to do now is to
2 talk about the actual content of what is in each of
3 these sections. So I'm going to take them section-by-
4 section. And let me take this proposed general
5 principles section -- which will not appear here,
6 it'll appear further down. But this is the most
7 coherent representation of it, so I'd like to get you
8 to go ahead and react to that.

9 Let's -- let me take a moment and allow
10 people to read it.

11 MS. FLAWN: We could work on that until we
12 get the copies of it.

13 MR. FAULKNER: Okay. All right.
14 Tyrrell's made a good point. Tyrrell says the copies
15 are actually going to be here momentarily and wait
16 until they get here. So let's go to whole number
17 arithmetic. That section -- go back to the other
18 version. There you go, go down to -- no, let's not do
19 that. Let's go to readiness. Yes. There you go.

20 Okay. Let's take the readiness section
21 here, the mathematics that children learn from
22 preschool through the middle grades, et cetera. Go on
23 down, Sarah. Let's -- let me just remind you what's
24 here.

25 DR. WU: But much of this is --

26 DR. FAULKNER: Some of it has been moved,

1 yes. You want to review that in the new version?

2 DR. FAULKNER: Okay. You want to move --
3 they want to review that one in the new version.
4 Okay, let's go to two then, whole number arithmetic.
5 Okay, Tom?

6 DR. LOVELESS: This was an edit that we
7 made in our group. And it didn't show up in this
8 particular version, but the -- under F --

9 DR. FAULKNER: We could not get to all --

10 DR. LOVELESS: I understand, understand.

11 DR. FAULKNER: We didn't have enough time.

12 DR. LOVELESS: But I want to be sure to
13 raise it so that it gets --

14 DR. FAULKNER: There's no plot
15 necessarily.

16 DR. LOVELESS: I understand.

17 DR. FAULKNER: There may be a plot.

18 DR. LOVELESS: Under F, letter F, China is
19 not a good example to be using there. China's only
20 participated, to my knowledge, in one international
21 assessment, and there were sampling problems. So I
22 recommend substituting Singapore to use as the example
23 of a high achieving country.

24 DR. FAULKNER: Is there any agree -- any
25 disagreement in that?

26 DR. REYNA: No.

1 DR. FAULKNER: Okay. Okay, then let's go
2 ahead and take -- let's continue other discussion in
3 the section on whole number arithmetic. Bert?

4 DR. FRISTEDT: I tend to agree with most
5 everything that's in here, but I'm wondering if we
6 really know some of these things. I mean I read it
7 and I say that sounds good, but for example do we
8 really know that the elementary school textbooks in
9 this country don't have enough double and triple digit
10 addition and multiplication problems? I know it's not
11 getting emphasized, at least that's my understanding,
12 but if we -- if it just sits there it just looks like
13 we're throwing out a strong statement without really
14 knowing that it's accurate.

15 DR. FAULKNER: Well, Tom just brought up
16 Singapore. I presume he knew what he was talking
17 about.

18 DR. LOVELESS: I was referring to whether
19 or not China was high achieving versus Singapore.

20 DR. FAULKNER: No, but we're -- I think
21 the implication here is that Singapore's books are
22 different than our books.

23 DR. LOVELESS: No, I raised that also as
24 problematic. I don't -- with Singapore, I do know
25 that the statement is true, in terms of the Singapore
26 text. Yes, that's true.

1 DR. CLEMENTS: And Susan's research, for
2 instance, looks specifically at other textbooks from
3 other countries and textbooks from the United States,
4 counted the number of times. We do a lot more of two
5 plus two and two plus three, they are right into eight
6 plus seven, so -- at the same point in the child's
7 development. So I think there's adequate empirical
8 research that has compared those.

9 DR. STOTSKY: This is a question that
10 relates to a lot of the statements here, not just that
11 one. Should this be like a research paper in which
12 you're referencing at least a study. There have been
13 an awful lot of declarative statements throughout
14 here.

15 DR. FAULKNER: Yes.

16 DR. STOTSKY: And I'm worried about --

17 DR. FAULKNER: Well, I think that's
18 exactly right. And I think we're going to have to be
19 careful when we go through this document and actually
20 check all that out. I think that we will have to
21 decide whether we want to try to carry citations in
22 the final report of the Panel or whether we want to
23 leave the citation record in the task group reports.

24 The Panel's by and large -- the Panel's
25 report is by and large derived from what was done in
26 the task groups. There's a lot of citation in the

1 task group reports. And as long as it's adequately
2 supported at that point, my inclination is to feel
3 that we don't have to cover up the panel report with
4 citations. But we may change our views about that. I
5 think we're just going to have to feel our way through
6 that.

7 I think, Sandy, you're absolutely right,
8 and Bert. We have to be certain that there's adequate
9 authority for what we claim. As to where that
10 authority is cited, I think we have a little bit of
11 latitude, and we can talk about that later. And I've
12 got Bert, I've got Valerie. Go ahead, Bert.

13 No, not yet. You're after Valerie.

14 DR. FRISTEDT: My little follow-up to that
15 is I noticed, for example, in 1-B where a very
16 controversial topic is being discussed. This is on
17 page 3 at the bottom. We got quite a long paragraph
18 there. So I'm advocating a middle ground on this
19 issue of justifying statements. When we know they're
20 going to be controversial then we should do a little
21 more to indicate on what basis we know we're making
22 it, whereas when it's something that we have a basis
23 for that we think more or less people will agree with
24 then we can be briefer.

25 DR. FAULKNER: Okay. Well, we're going to
26 have to come to terms with whatever it is we choose to

1 do.

2 DR. FAULKNER: Or no, I think it's
3 Valerie, then Bob.

4 DR. REYNA: Mine's brief. I was going to
5 say -- I was going to make a recommendation at some
6 point that we have an annotation that would be flush
7 right that would reference the pages or line numbers
8 of the original task group reports. And it would not
9 interfere with the prose flow because it would be
10 flush right.

11 DR. BENBOW: Bob?

12 DR. SIEGLER: Point J under the whole
13 number section, which is on page 5 of the written
14 document, I think would be better stated in the
15 general principles of learning section because it
16 applies to all the sections equally.

17 MR. BENBOW: All right. Wade?

18 MR. BOYKIN: This comes up for me several
19 times and maybe I need to be put at ease about it, but
20 when you look at points -- whoops, F and G on page 5,
21 for example, it wasn't clear to me why those are going
22 in this section rather than in the instructional
23 materials and practices section when you're talking
24 about textbooks and curriculum. That comes up at
25 other times through the teacher references in a
26 similar vein.

1 I'm wondering just about that from a
2 structural standpoint. Should we keep the apples with
3 the apples, oranges with oranges, or should it matter?
4 I'm saying this out loud to the whole group. And
5 these are just two cases in point. F and G, 2-F and
6 G.

7 DR. BENBOW: So what are you saying? I'm
8 sorry, I didn't --

9 DR. BENBOW: Are they instructional
10 materials?

11 DR. BOYKIN: Yes. They're about
12 textbooks, about curriculum. And there's a section
13 called instructional materials and practices. I'm
14 wondering if those kinds of statements, should we put
15 those in the same section rather than have them
16 interspersed. And it seems this is a little
17 structurally problematic.

18 MR. BENBOW: Wilfried?

19 MR. SCHMID: Well, I mean obviously you
20 have a good point. I would say that sometimes there
21 is -- it's a gray area. And so here yes, there's
22 learning materials, but I think much of it is really
23 based on substance of what are the prerequisites. And
24 in this particular case I would say that this should
25 probably stay, but in many other cases I'm sure I
26 would go with you.

1 DR. BENBOW: Liping?

2 DR. MA: Under the whole number
3 arithmetic, the item F. I -- is this F? Yes. I have
4 an observation, which is not mentioned here but
5 related to this item is F. In U.S. elementary
6 schools, we do much more column computation versus
7 horizontal computation in comparison with other
8 countries. That, I think, even contributes more to
9 the learning of algebra, because children in other
10 countries get familiar with the computation in
11 horizontal expressions much more than children in U.S.
12 I would like to mention this and -- if we put this in,
13 we can maybe add a very parallel thing.

14 DR. MA: And it's very obvious if you --
15 we compare textbooks from other countries --

16 DR. BENBOW: Skip?

17 DR. FENNELL: That's a good point. And
18 Liping's right. And I'm just trying to figure out how
19 to consider amending the statement that's there. I
20 think, Liping, it's probably appropriate there to sort
21 of connect it back to textual kinds of materials, but
22 there's also instructional. I mean if you just -- and
23 I'm sure you know when you visit classrooms we see
24 American teachers vertically doing practice far more,
25 multiple times more than any kind of a horizontal
26 thing. I was just looking at --

1 DR. GEARY: Single digit numbers.

2 DR. FENNEL: Yes. I was looking at Dave.

3 I know in their learning analysis when they listed
4 algebra, they do make some reference to that in terms
5 of equation solving. So there's an opportunity here
6 that maybe we should take advantage of.

7 DR. BENBOW: Do you think it should be a
8 separate recommendation rather than trying to build it
9 in?

10 DR. GEARY: I have a question.

11 DR. FENNEL: Go ahead, Dave.

12 DR. BENBOW: Okay, I don't know who raised
13 their hand first.

14 DR. GEARY: It was a tie.

15 DR. BENBOW: Okay, Dave.

16 DR. LOVELESS: It was a tie.

17 DR. BENBOW: Okay.

18 DR. GEARY: Yes. The particular statement
19 there in this section is trying to reference it to the
20 fact that practice isn't well built into -- practice
21 of difficult problems isn't well built into the
22 curricula. But I think the point about the horizontal
23 presentation is a very big point. And U.S. kids in
24 processing algebraic linear equations, they -- they're
25 not doing it horizontally. They're not processing it
26 the same way somebody who's skilled at it would do it.

1 It's not coming -- it's not something that comes
2 automatically without math equations.

3 DR. BENBOW: So you're basically saying
4 separate recommendation?

5 DR. GEARY: I'm saying separate, but a
6 great point that needs to be somewhere.

7 DR. BENBOW: Yes, okay. Tom?

8 DR. LOVELESS: I'm concerned about two --
9 I have two questions. Liping's point is a good one,
10 but my two questions would be A, do we have any
11 empirical evidence that indeed this is true, that
12 other countries do these computations horizontally
13 more than the United States. And then B, do we know
14 that that has some impact on later learning or what's
15 the effect?

16 DR. BENBOW: Liping?

17 DR. MA: Yes. In China, they introduce
18 the column computation when children learn two digit,
19 adding two digits, addition of two digit numbers. For
20 Russia, they start even later, when they do --
21 children do three digits, addition with three digit
22 numbers. So before that, children are not exposed to
23 columns at all. That is the facts. You can -- it's
24 in textbooks. Anyone can see. But we start with one
25 digit number.

26 DR. LOVELESS: And the causal evidence

1 that that then enhances learning?

2 DR. MA: I don't have data about that, but
3 -- yes, I don't have data, but the achievement of
4 students, I think it's obvious for laypeople, maybe
5 not for scientists.

6 DR. BENBOW: Very nice.

7 DR. LOVELESS: I have never been called a
8 scientist in my life.

9 DR. BENBOW: Wilfried?

10 DR. SCHMID: Well, it seems to me that
11 this point at least should be addressed in one of the
12 task group reports, which I assume is not the case at
13 the moment. And for one thing, I believe that to get
14 this point across it takes a little space; right? I
15 mean you need, you know, two or three paragraphs. And
16 if there is to be a recommendation in the report
17 itself, and I'm not taking a position on that, there
18 must be a basis, a basis for advancement.

19 DR. BENBOW: Deborah?

20 DR. LOEWENBERG-BALL: One way to get
21 around what we've just been discussing for the basis
22 is to argue this logically. If you know that in
23 algebra things are represented horizontally, then you
24 can make a claim directly from the mathematics that
25 it's important for students to have experiences with
26 that format. I'm not sure that we have to go through

1 the international comparisons to say this, because
2 that's actually what's now coming, do we have analyses
3 of these textbooks. We probably don't have ones that
4 are sufficient for the claim, but one can make the
5 claim from the math.

6 DR. BENBOW: Well, it may have to just
7 label it professional judgment and logic, I guess.
8 And --

9 DR. LOEWENBERG-BALL: Right, the content
10 also could dictate this --

11 DR. BENBOW: Yes.

12 DR. LOEWENBERG-BALL: That's another way
13 we could approach it.

14 DR. SIEGLER: Yes. I share the widespread
15 impression that what Liping says is very likely true.

16 And I think it would bear mentioning someplace either
17 in the Learning Processes or Instructional Practices
18 group.

19 However, I also share Tom's reluctance to
20 put it in the summary report because we don't have --
21 you know, there are many things that are very
22 plausible that you could say are logical and they
23 don't turn out to be true. And so I'd be a little
24 reluctant to promote this to the status of something
25 that should be in this 30-page report.

26 DR. BENBOW: Vern?

1 MR. WILLIAMS: But have we looked for
2 research to support or go against what she said?

3 DR. BENBOW: Dave?

4 DR. GEARY: The only work I'm aware of
5 that came up in our -- in the Learning Process reviews
6 were those for the processing of linear equations in
7 algebra. And what comes up there is that students
8 aren't processing it the way somebody who's skilled in
9 mathematics would process it in terms of expressions
10 and horizontally. The factors that contribute to that
11 we don't know.

12 It seems like one potential contributing
13 factor is inexperience in processing mathematical
14 expressions or information horizontally, or they don't
15 have much experience. But whether it would be in this
16 re -- in a summary report, I agree, it's a stretch.
17 But I think it's a really good idea and a good point
18 that needs to be somewhere.

19 DR. BENBOW: Could we put it as a research
20 question at the bottom? I'm just asking -- if this
21 might be a viable approach that we would -- I'm just -
22 - I'm -- yes, but this is a viable approach but it
23 needs to be researched. I'm just trying to compromise
24 here, find a compromise.

25 DR. LOVELESS: I think that's possible,
26 but we have to know more about what the existing

1 research base is on this. There may be some research
2 on it. We don't know. We have not looked, so that
3 point is very good. There is research on the question
4 of what do kids do when they confront an equal sign.
5 And we do know that they often think now you need to
6 do something when they encounter an equal sign. And
7 that's related to this topic.

8 DR. BENBOW: So are you going to put it
9 into your task group report? And should we leave it
10 there, and maybe have it as a recommendation for
11 research? How would you like to go forward here?

12 DR. GEARY: Well, I'm not sure. We could
13 certainly find a place for it as kind of a speculative
14 statement in our report. Our report is awful long and
15 dense.

16 DR. GEARY: And overly referenced with --
17 I think we've broken 600 references. So I think it
18 would get lost.

19 DR. BENBOW: Okay. Joan?

20 DR. FERRINI-MUNDY: I was struck by what
21 Tom said. And there is a nice section in the report
22 about -- a short paragraph about the research around
23 the equal sign, which seems like it would possibly be
24 a place without a lot of additional work that this
25 point could be brought up. It seems to fit.

26 DR. GEARY: Yes. The difference -- yes,

1 it could be done. And I would be happy to do it and
2 it would be there. Whether it would come to the front
3 -- it'll be there if you guys want it.

4 DR. BENBOW: Okay.

5 DR. GEARY: It will happen.

6 DR. BENBOW: Solve this for us --

7 DR. GEARY: How's that?

8 DR. BENBOW: -- and put it there.

9 DR. GEARY: All right, we'll do that.

10 DR. BENBOW: Okay. All right, so I am
11 understanding now that this topic was going to be put
12 into your task group report. All right. Then I open
13 it up for another topic and turn it over to you again.

14 DR. FAULKNER: Where we are is still on
15 whole number arithmetic. Is there anything else
16 anybody wants to bring up in whole number arithmetic?
17 Bert?

18 DR. FRISTEDT: I could bring that up any
19 number of places, but I might as well bring it up
20 here. It's this interplay between research and
21 professional judgment that comes up a lot. And in
22 some ways it bothers me a lot because if one focuses
23 too much on what has been researched, one might not be
24 dealing with what the most important issues are.
25 Because if one focuses on what's been researched, it's
26 what those people thought was important.

1 DR. FAULKNER: Or what was accessible.

2 DR. FRISTEDT: Or -- yes. And some of
3 these things -- and of course the Conceptual Knowledge
4 and Skills group mostly, they can't -- they're not
5 going to have research that says well, this is a
6 particularly important part of algebra. They're using
7 their professional judgment. There's another
8 way that professional judgment is coming in that I
9 don't think we acknowledge enough. And that is in
10 going from the research to the actual statements we
11 make in the document, that there often is professional
12 judgment there. And so if we have this dichotomy that
13 there's either professional judgment or research, I
14 think that's probably not fully accurate.

15 And I, in this general section, do we
16 really have research that supports each of the
17 statements, or is it these are natural statements that
18 come out of the research, sort of combining common
19 sense with the research? And I've had that concern
20 throughout the document in lots of places, but maybe I
21 just don't know the research well enough. There's a
22 possibility --

23 DR. FAULKNER: Well, there's a lot of
24 research that does exist in -- on many of these
25 points, but I think we'll have to go through and, when
26 we prepare this document, and satisfy ourselves that

1 we have a basis for making the statements we make.

2 I think as we've done the task group
3 reports we've been pretty faithful to that rule. I
4 mean we've been pretty clear about why we've made
5 whatever statements we've made.

6 Sandra?

7 DR. STOTSKY: Sorry, put my light on first
8 before raising my hand. I'm getting this backwards.

9 There's a concern that this raises about
10 the statements not having many of the necessary
11 qualifications that they actually have back in the
12 original documents. Many of them somehow emerge here,
13 sort of stripped of the necessary claims or
14 qualifications that would be made when you actually
15 look at the body of research. And --

16 DR. FAULKNER: Well, again, the text
17 that's going to be transported and put together is the
18 language in the working papers. If those
19 qualifications are in the working papers, they'll show
20 up in the report.

21 DR. STOTSKY: If they're in the working
22 papers.

23 DR. FAULKNER: Yes.

24 DR. STOTSKY: But if they are not even in
25 the working papers --

26 DR. FAULKNER: If they're not in the

1 working papers then we've got --

2 DR. STOTSKY: We've got a problem.

3 DR. FAULKNER: -- an issue. I'm going to
4 work with the working papers.

5 DR. STOTSKY: Okay.

6 DR. FAULKNER: The working papers --

7 DR. STOTSKY: I worry about a lot of the
8 statements here with a lot of the qualifying remarks
9 that --

10 DR. FAULKNER: Well, we're going to have a
11 problem, of course, in that we're trying to produce a
12 compact report. Now we're not going to be able to put
13 every amplification and every point in that compact
14 report. Wade?

15 DR. BOYKIN: Yes, just a comment. I was
16 under the impression that we brought Abt Associates
17 into this vetting process to try to determine the
18 empirical veracity of claims made in the task group
19 reports. So there is at least that element that's
20 there as sort of a safeguard for, you know, claims
21 that aren't specifically backed up data. I mean I
22 think that maybe needs to be mentioned somewhere in
23 the report perhaps, I don't know.

24 DR. FAULKNER: Well, I don't think that's
25 quite accurate. I mean I think Abt has checked things
26 we've asked them to check. I'm not sure that they've

1 been -- they've taken the position that they're the
2 insurer of everything we've written. I think we're
3 supposed to be the insurer of what we wrote. Yes.

4 DR. REYNA: The issue of this
5 qualification would also be partially addressed by the
6 suggestion to indicate the places in the original task
7 group reports where these points are discussed in more
8 detail.

9 DR. FAULKNER: Yes. I think we need to
10 move onto whole number arithmetic here, or do you see
11 problems that you think need to be brought up? I
12 think why don't we go down below D to E and beyond.
13 Wait, wait, wait, wait. E and beyond. We're
14 satisfied with whole number arithmetic aside from the
15 buttressing of claims? Yes. Who said something?

16 Oh, okay. All right, Bert.

17 DR. FRISTEDT: I don't have a comment in
18 connection with estimation. There's several comments
19 connected with it. This precedes fractions, so are we
20 there?

21 DR. FAULKNER: No.

22 DR. FRISTEDT: Oh, we're not that far yet?

23 DR. FAULKNER: No. We're in whole number
24 arithmetic.

25 DR. FRISTEDT: Okay.

26 DR. FAULKNER: What I want to do is --

1 DR. FRISTEDT: I'll pass up.

2 DR. FAULKNER: Okay. Now what I want to
3 do is go back and take this new document that has just
4 arrived, Acquiring Knowledge and Skills Needed to
5 Learn Algebra. It's just the first part of it there.
6 Take Section 1, and I'd like you to look at the
7 content of Section 1, the general principles of
8 learning, which will not be Section 1. It will be
9 something like 6 or 7 or 8.

10 All right. But I want you to look at the
11 content here and tell me whether you are satisfied
12 with this content or whether there's discussion to be
13 made. Go down to the social motivational and
14 affective influences, all the way through those,
15 everything in 1 down to readiness for learning. Russ?

16 DR. WHITEHURST: I have a concern, not
17 about the organizational material, but one of the
18 statements made. It's on the second page. It's the
19 sentence just before letter H, "Gender differences are
20 small and a focus on sex differences has distracted
21 from the task of raising the scores of both boys and
22 girls." Sex differences did not used to be small.
23 They used to be a lot larger, and so to claim that
24 focusing on them and seeing some progress over the
25 last 20 years has been a distraction I think is an
26 unnecessary claim.

1 One might also take the perspective that
2 girls do substantially better than boys on other
3 subjects, like reading. And so perhaps what has
4 emerged as equality, at least in elementary and middle
5 school, represents girls and women still undershooting
6 what they would be capable of doing if they did not
7 continue to have self-perceptions about math that are
8 -- can be defeating in terms of aspirations. So I
9 just don't see the necessity for this statement.

10 DR. FAULKNER: Dave?

11 DR. GEARY: Yes. This is quite a
12 complicated topic. And in the Learning Processes
13 report, we asked Abt and STPI to put together
14 estimates of sex differences at the mean and at the
15 extremes for multiple, many, many national databases.

16
17 The mean differences are very small. The
18 mean differences have always been much smaller than
19 they have been at the extremes. Girls have been
20 getting better grades in mathematics at least as --
21 for the last two and a half, three years, which is --
22 I don't know any data prior to that, but it may well
23 be the case that that's there.

24 Yes, the sex differences in writing and
25 reading are very robust and have not changed much,
26 possibly even gotten worse at the mean level. So I

1 think the mechanisms underlying those different
2 patterns of performance I think are different. And so
3 I think we either state something like the differences
4 are small -- and I have no problem stating that, you
5 know, on a -- the second -- the last sentence there,
6 be 4-H, deleting the cause there. But I mean we
7 either give in to this in extreme detail and really
8 unpack it, or we have to say, you know, the
9 differences are small and really we want to improve
10 both boys and girls. That's it.

11 DR. FAULKNER: Yes? Valerie's next.

12 DR. CLEMENTS: Real quick, to anyone who
13 does this kind of research, do you think that since
14 we're trying to say our major messages here, if
15 they're small do you think that saying that delivers
16 an implication that will change policy in constructive
17 ways? Or is it just not one of the major points we
18 have to make here?

19 DR. FAULKNER: Go ahead, Dave.

20 DR. GEARY: Well, the one potential point
21 is lots of resources are being focused on improving
22 the performance of girls. And that's fine, but it's
23 based on perception that there's a large intractable
24 gap. And that, if we look at mean differences, is not
25 the case. It is the case when we look at extremes.
26 And those differences have come down, and I'm sure for

1 a variety of reasons, including girls taking more high
2 school higher-level mathematics courses. But, you
3 know, so a lot of money is being targeted in ways that
4 might be better spent to improve performance of both
5 boys and girls.

6 DR. FAULKNER: Valerie?

7 DR. REYNA: Perhaps one way to separate
8 these issues is to talk about the difference between
9 ability, which this statement addresses, and
10 attainment. And both of those are policy relevant,
11 but they cut in somewhat different directions.

12 The ability issue I think Dave has
13 summarized well. There are differences at the high
14 end, at the high extreme. There are also differences
15 at the low end, which we also deleted from our summary
16 statement. So boys are over represented at the low
17 end as well as being over represented at the high end.
18 And what we wanted to convey here, I think, was that
19 inherent ability, there's no evidence, you know, there
20 -- or the evidence is getting weaker every day for any
21 kind of -- that sort of difference.

22 There's also some recent work that shows
23 that very limited practice and experiences will narrow
24 this gender gap considerably. All of what I said so
25 far speaks to the issue of inherent ability. So
26 that's one policy relevant statement, and I think it's

1 an important policy relevant statement.

2 The other issue that Russ raises, however,
3 has to do with attainment. And I don't know if we can
4 cobble enough evidence from what we've already
5 reviewed to address that. And that is despite what it
6 -- what may be, you know, the equal capabilities, or
7 roughly equal capabilities, you know, why is the
8 attainment so different in terms of careers and
9 science and mathematics. And there, there may be a
10 significant gap. And again, that cuts in the opposite
11 direction.

12 So perhaps making both of these
13 statements, ability yes, attainment no, might have
14 policy implications.

15 DR. FAULKNER: Okay. Anything else?
16 Other items in these, the general principles of
17 learning? Any other comments? Tom?

18 DR. LOVELESS: On items E and F. Item E
19 begins "Other factors include attitudes," blah, blah,
20 blah. I'm not sure what the other factors are related
21 to, what those other factors are factors of.

22 The second part of that it says "And
23 school based factors such as features of teaching and
24 learning context." And I think that's very vague. I
25 don't know what particular features of teaching and
26 learning context are being referenced there.

1 And then in F there's a long list of
2 things: stereotype threat. And I'm very much
3 persuaded that the experimental evidence on stereotype
4 threat needs to be emphasized here. But the other
5 things I think the evidence is much weaker, cognitive
6 load, strategy use, task engagement, self-efficacy,
7 teacher involvement. That's very vague. And then we
8 have this phrase, "And school based factors." And I
9 don't know what school-based factors are being
10 referred to.

11 So I think both E and F need to be cleaned
12 up, and I would reduce the list of things and really
13 let stereotype threat have its own place there.

14 DR. FAULKNER: Who's going to clean it
15 up? DR. EMBRETSON: Could I make the opposite
16 suggestion about stereotypic threat?

17 DR. FAULKNER: Yes.

18 DR. EMBRETSON: The procedures that were
19 used to review the literature did not pick up
20 technical reports from major test publishers, who in
21 fact have looked at stereotypic --

22 DR. BOYKIN: Turn your microphone on.

23 DR. EMBRETSON: It is on, but it's
24 not --

25 DR. BOYKIN: It's not working.

26 DR. EMBRETSON: It's not working?

1 DR. FAULKNER: You just may not have it
2 pushed hard enough.

3 DR. EMBRETSON: Yes. What I want to say
4 here is that the experimental evidence is different
5 than studies that have been conducted by test
6 publishers. These studies were not picked up in the
7 review procedures. You'd have to go to different
8 reports of ETS, ACT and so on. They have tried
9 measures to counter stereotypic threat and they have
10 led to little or no improvement. So we do have a
11 different literature here.

12 So I wouldn't separate it out. I would
13 just contextualize it, say the experimental studies
14 show that, because if you don't say that you're not
15 going to be accurate.

16 DR. LOVELESS: Well, those are really two
17 different things. I'm referring to the evidence that
18 stereotypic threat is a real thing and you're
19 referring to interventions that tried to ameliorate
20 it. And I'm -- I agree with you that that's weaker
21 and we don't know a whole lot about that. But
22 certainly the evidence on stereotype threat is pretty
23 convincing.

24 DR. EMBRETSON: Well, the way they were
25 mediating it was simply to have -- to do matching of
26 examiners and examinees, and that was the mediation.

1 So that's not a real mediation, it's just saying that
2 it didn't make much difference.

3 DR. FAULKNER: Val?

4 DR. REYNA: I think this is sort of a
5 classic example of how you, you know, summarize
6 literature. When people obtain null effects, as we
7 said in our standards document, especially non-peer
8 reviewed null effects; I don't think that counts
9 either for or against a claim. Based on the published
10 peer reviewed top journal type evidence, there have
11 been interventions that have shown significant
12 effects.

13 The Johnson et al. article in
14 Psychological Science, as well as a number of others
15 that we reviewed as part of our, you know, very
16 systematic review of the literature, did show that if
17 using interventions that were done in educational
18 classroom settings there with, you know, experiments
19 and tight controls, showed that in fact that -- and
20 there's also -- not only is there evidence for the
21 effectiveness of reducing stereotype threat, there's
22 evidence for the mechanism by which this actually
23 occurs. So the evidence is pretty good.

24 DR. EMBRETSON: Let me still counter it
25 because everybody knows that null findings are not
26 really well accepted by journals. And so the studies

1 that I'm referring to in fact are not published
2 because they're not findings that are intriguing in
3 that sense. And people -- in fact, the people who
4 designed these studies had really hoped they would
5 work, but they didn't.

6 DR. FAULKNER: Well, I noticed, Tom, that
7 there are notations here, Learning Processes 26 to 79.
8 It may be that the text that's being cited here is
9 enough -- has enough detail to explicate the questions
10 that you were raising.

11 DR. LOVELESS: I'd be fascinated to know
12 what the school-based factors are.

13 DR. FAULKNER: Right. But I guess what
14 I'm saying is we don't necessarily have to clean up E
15 and F as long as the text that gets drawn in because
16 of E and F is actually descriptive. Wade?

17 DR. BOYKIN: Let me just say that some of
18 these points were stitched together rather hastily to
19 make sure they got in here before you all met. And
20 they can be cleaned up and they can be clarified. And
21 we'll make sure that we do that.

22 DR. FAULKNER: Okay. Well --

23 DR. BOYKIN: If the broad points, you
24 know, we agree to, we can make them, you know, more
25 substantive and more clear.

26 DR. FAULKNER: Okay. Bert?

1 DR. FRISTEDT: Quick comment. If you end
2 up having to trim down, two points that I don't want
3 trimmed away are J and K.

4 DR. FAULKNER: Oh, I think you won't --
5 you'll find a lot of support for not getting those
6 trimmed away. Are we okay with general principles,
7 Section 1? Looks like it.

8 DR. FENNEL: Generally, I liked what Wade
9 said because I think they do need to be trimmed down
10 and read a little bit punchier, more concisely, if
11 possible, but the intent I think is fine. Thanks.

12 DR. FAULKNER: All right. Let's go now to
13 Section 2, if we may. Did you have something, Wade?

14 DR. BOYKIN: I just don't have a copy so
15 I'm just giving them back.

16 DR. FAULKNER: Oh, okay. Well, after
17 Section 2 you won't need it anymore. Section 2,
18 readiness for learning, has been edited relative to
19 the original second concept that you have here. So
20 let's look at readiness for learning in this version
21 here with Arial font. Yes?

22 DR. WU: What are we doing here? Are we
23 saying let's go as low or as high as we can to see if
24 we can decide this is better? Is that what we're
25 trying to do?

26 DR. FAULKNER: I'm sorry, what --

1 DR. WU: I mean this is the new -- I mean
2 this is the version proposed by --

3 DR. FAULKNER: No. What happened is that
4 the -- you may recall that when we talked about a
5 section called Acquiring Knowledge and Skills --

6 DR. WU: Yes.

7 DR. FAULKNER: -- Needed to Learn Algebra.

8 DR. WU: Yes, yes.

9 DR. FAULKNER: -- that what appeared to be
10 the resolution to that is that the general section,
11 the Section 1, we agreed to present as a general
12 section, but later in the document.

13 DR. WU: Yes.

14 DR. FAULKNER: Okay? And then that caused
15 the Section 1 that exists in this document and
16 representative Section 2 in the Arial document, it
17 causes it to be edited some. And so I'm asking us to
18 review the version that's in the Arial document.

19 It will become Section 1 again, but it's
20 not the same Section 1 that we had before. So I'm
21 asking you to look at Section 2, Readiness for
22 Learning, in the form of this Arial document.

23 DR. WU: Okay.

24 DR. FAULKNER: Okay?

25 DR. WU: Oh, a different place. Okay.

26 Thanks.

1 DR. FAULKNER: Bob?

2 DR. SIEGLER: There was a point that came
3 up in my synthesis group this morning that we didn't
4 have a chance to work on, but that I think is a good
5 change here to the Section 2. And that has to do with
6 taking the -- let's see, the last two points, F and G,
7 and changing the wording; the concern was that it
8 might seem too self-serving where particulars of
9 scaling up kinds of issues.

10 DR. FAULKNER: Is this E and F in the
11 Arial document?

12 DR. SIEGLER: Oh, yes, I'm still on the
13 old document.

14 DR. FAULKNER: Yes.

15 DR. SIEGLER: Yes, E and F. That's right,
16 E and F in the Arial document.

17 DR. BENBOW: E and F of the Arial
18 document.

19 MS. FLAWN: In the new one.

20 DR. BENBOW: The new document.

21 DR. SIEGLER: That's right. I think we
22 want to change those two points into one and to say
23 that a variety of instructional programs have been
24 developed to include the mathematical knowledge of
25 preschoolers and kindergarteners, especially those in
26 at-risk backgrounds that have yielded encouraging

1 result. There is a need to invest in research on
2 effective preschool interventions.

3 DR. FAULKNER: What is your -- what's that
4 last sentence?

5 DR. FAULKNER: There is a need to invest
6 in research on effective preschool interventions.

7 DR. REYNA: Is that research vital? And
8 I'm wondering if all of the research should go at the
9 end.

10 DR. FAULKNER: I think Tyrrell's reaction
11 is we can figure that out later, which I think is
12 accurate. Yes?

13 DR. FRISTEDT: I have a different point.
14 In connection with E, a variety of instructional
15 programs have been developed. Might be nice to
16 mention some of them. If we're -- and the one I have
17 in mind is the one that Cynthia Jones mentioned at the
18 public session in Chicago, where the slow learners had
19 a special seminar along with the -- but they go to the
20 regular class. But, then the special class would try
21 to, as I understood it, make sure that they kept up
22 with the prerequisite material and skills, so just
23 some examples anyway.

24 DR. FAULKNER: Yes, go ahead, Valerie.

25 DR. REYNA: There may be issues with
26 endorsing that particular thing, especially since we

1 don't have peer-reviewed literature on it necessarily.
2 I -- the -- but we do have some concrete evidence -- I
3 was going to make a similar point.

4 I would mention here perhaps the number
5 line training which -- that we have reviewed. We do
6 have peer-reviewed evidence about. And we have
7 various other things, like in -- and this doesn't
8 pertain to the whole number section, but under
9 fractions we have other interventions we could mention
10 specifically that have to do with part-whole games and
11 those kinds of things. So I would say a couple of
12 examples would be helpful here.

13 DR. FAULKNER: Yes, I don't disagree.
14 Bert?

15 DR. REYNA: The board game -- well, we
16 can't name it, but board games that involve counting.

17 DR. FRISTEDT: In connection with the
18 number line, I noticed that Learning Processes paid
19 quite a bit of attention to understanding inequalities
20 essentially on the number line and where numbers are.
21 I didn't see much attention to using the number line
22 to represent addition and subtraction, and that can
23 carry over to fractions. But maybe there's no
24 research, I don't know.

25 DR. REYNA: There is research and it does.

26 DR. FAULKNER: Okay, other items on the

1 readiness for learning section. All right. What I'm
2 hearing us say is that we've now worked through
3 Sections 1, 2 and 3. We've worked through the
4 general, we've worked through readiness for learning,
5 and we've worked through the whole number section.
6 Now we can go back to the original second common
7 concept, the one with the numbered lines. And we'll
8 go to number sense, which is Section 3 in that
9 document. And it's on page 5. So let me ask you if
10 you have comments or questions about the number sense
11 provisions. Wilfried?

12 DR. SCHMID: You've warned us that we
13 should not engage in wordsmithing. Nonetheless,
14 reading 3-A, that's something that I find really
15 striking. So it starts out with number sense and
16 proficiency at approximating numerical magnitudes.
17 That is surely true. I am not quite sure whether this
18 needs to be the first sentence here, but if it is then
19 the next -- the start of the next sentence is really
20 bothersome.

21 "Such proficiency," because now that
22 refers to proficiency at approximating numerical
23 magnitudes. There's then a huge list of components.
24 And these components, of course, are very important on
25 their own. They're not just important because they
26 make it possible to approximate numerical magnitudes.

1 So I mean this is -- you know, this is garbled. And
2 we should take note of the fact that this paragraph is
3 garbled, and when it's rewritten that garbling has to
4 be ungarbled.

5 DR. FENNEL: Okay, I could, let me -- I'm
6 going to jump in here. I -- what hap -- this is Sandy
7 referred to this. When we take work from other places
8 and move it into these new positions we lose stuff.
9 And boy did we lose stuff here.

10 This -- the issue of magnitude is an
11 element of number sense. And we -- we're fine with
12 that and then we launch into a discussion. Applying
13 magnitude relates to all those other things. Yes, I
14 totally agree and this needs to go back to work again.
15 Maybe Bob, because you were in trouble doing this.

16 DR. SIEGLER: Just a quick suggestion. Is
17 this --

18 DR. SCHMID: Yes, it's on now.

19 DR. SIEGLER: A quick suggested fix,
20 because I agree with both of your points.

21 DR. FAULKNER: Where do I get the lines?

22 DR. SIEGLER: Okay, this is 189 in the old
23 section.

24 DR. FAULKNER: Yes.

25 DR. SIEGLER: Among the key elements of
26 number sense is understanding place value, how numbers

1 can be decomposed. Would that meet --

2 DR. FAULKNER: Where are you --

3 DR. SIEGLER: This is --

4 DR. FAULKNER: Where are you getting that?

5 DR. SIEGLER: It's --

6 MS. FLAWN: It's Learning Processes.

7 DR. FAULKNER: That's from Learning
8 Processes?

9 MS. FLAWN: Yes.

10 DR. SIEGLER: Oh, I thought you wanted us
11 to work from the section with number 11.

12 DR. SCHMID: This one. It's this one.

13 DR. SIEGLER: Oh.

14 DR. SCHMID: So it's 214.

15 DR. FAULKNER: Yes, we're in 214.

16 DR. SIEGLER: Right, 214. At the -- the
17 second sentence could begin "Among the key elements of
18 number sense are," and then continuing with
19 understanding of place value, how numbers could be
20 decomposed and recomposed.

21 DR. SCHMID: Well, the first sentence
22 should really not be the first sentence. It should be
23 in there, but not as the first sentence.

24 DR. FENNEL: It needs a rewrite, let's
25 just rewrite it.

26 DR. FAULKNER: Okay.

1 DR. FAULKNER: Skip is going to fix it.
2 Okay. All right, other questions about number sense?
3 Deborah and -- oh, Dave, Dave then Deborah. Dave then
4 Deborah then --

5 DR. GEARY: Yes, one point that came up in
6 our discussions this morning was whether we want to
7 separate number sense into those areas in which kids
8 seem to inherently and early on have knowledge. And
9 then which may be important for, but is very different
10 from the number sense that emerges as a result of good
11 mathematics education.

12 And so part of the mixing up of -- part of
13 what's going on is mixing up some of those different
14 features. So it's reading an A and B, or separating
15 those out in some way may clarify a lot in this area.

16 DR. FENNEL: Maybe you should help us.

17 DR. GEARY: I have the horizontal. I'm
18 sure it's right.

19 DR. FAULKNER: All right, guys, come on.
20 We only have to hang on for 15 more minutes now.
21 Deborah?

22 DR. LOEWENBERG-BALL: C, D and E in this
23 section seem a little bit misfitting. C, I don't
24 know, it just seems a little vague to me. There are
25 lots of things that are involved in improving kids
26 number sense. And then D and E seem like they're in

1 the spirit of what Sandra was commenting on a little
2 minute -- few minutes ago. These are now
3 recommendations about instruction and about textbooks.
4 They either don't belong here or something, but
5 they're not comments about what number sense involves
6 or what we know about it.

7 DR. FAULKNER: So what are you saying, you
8 would delete those?

9 DR. LOEWENBERG-BALL: Well, D and E are
10 recommendations that don't -- they're both
11 recommendations. That's one comment. And they're
12 also about instruction and about textbooks, so they
13 wouldn't belong in this section that's about what this
14 competence involves. And C just seems like a
15 throwaway to me. I'd delete it.

16 There are many things we might comment on.
17 I've already just said two items about what
18 estimation involves and suddenly there's this
19 additional statement that also involves skill of
20 computation. I don't think we need it.

21 DR. CLEMENTS: A question about E to
22 whoever's got that in there. Do we know the textbooks
23 don't do this and changing this in textbooks makes a
24 difference to kids learning, or is it really that that
25 should stay there but be reformulated as what the
26 research shows, which I assume was that children don't

1 over -- always understand the purpose and leave it at
2 that? And I don't know, I'm honestly asking the
3 question of how much we know about that.

4 DR. SCHMID: Well, I mean I think that the
5 comment on E is -- really does not particularly apply
6 to whole number arithmetic. I mean it is a much more
7 general comment. It doesn't belong in this section.
8 I mean I think that the purpose of estimation is
9 really something that comes long after whole number
10 arithmetic. In whole number arithmetic and in number
11 sense, there should be some sense of order of
12 magnitude and this is being said already. But we
13 don't want to be advocating that in textbooks there be
14 a formal discussion of the purpose of estimation in
15 the context of whole number, of whole number
16 arithmetic. This is just ludicrous.

17 DR. FAULKNER: Joan and then Liping, then
18 Bert.

19 DR. FERRINI-MUNDY: I don't really have a
20 solution to the problem I'm about to raise, but this
21 sec -- you've got four content sections in this
22 overall section and three of them map directly to your
23 critical foundations. And this one doesn't, and I
24 think that's confusing. I think it's powerful if
25 you've got the three that map directly.

26 So we might want to contemplate some

1 solution to this if we want to keep -- and I think we
2 should try to keep the emphasis on number sense. But
3 maybe it's in a more general place or maybe the first
4 part, the number sense part gets rolled in somehow to
5 the whole number section and maybe the estimation. I
6 mean it does mention fractions, although I don't think
7 that connection's made strongly yet. But I just see a
8 logical issue --

9 DR. FAULKNER: I think that's a good
10 point.

11 DR. SCHMID: But I think that in fact the
12 issue is sort of bare bones estimation in the context
13 of whole number arithmetic is already in there in A.
14 I mean it's --

15 DR. FERRINI-MUNDY: Yes.

16 DR. SCHMID: -- it's being mentioned. And
17 I think this is exactly the right kind of emphasis to
18 give on estimation at that grade level.

19 DR. FERRINI-MUNDY: Right. I'm not
20 arguing with the content of it. I'm just saying I
21 think I see a logical problem.

22 DR. SCHMID: Yes. Well, I mean I agree
23 with you. I agree with you.

24 DR. FERRINI-MUNDY: Yes.

25 DR. SCHMID: I think that that is my point
26 here.

1 DR. FERRINI-MUNDY: Sure.

2 DR. SCHMID: I agree with you, that what
3 needs to be said about estimation is there. And then
4 what else is being said about estimation really
5 belongs into a different context.

6 DR. FAULKNER: Okay. It was Liping, then
7 Bert.

8 DR. MA: Yes. Personally I don't like the
9 term number sense because it's very vague, but that --
10 I know that will not count. But I was wondering if
11 there is any scientific research saying that place
12 value belongs to number sense. Because I think the
13 place -- the concept of place value came very late,
14 like only 800 years before we -- Europe adopted that
15 number system -- Arabic number system so that we have
16 number place value. But before that mathematics had
17 already developed very advanced, so I don't know, this
18 place value is it related to number sense.

19 But really I don't quite like the term
20 number sense because it's too vague for teachers to
21 follow, like to imply, to put in teaching. What
22 should I do to promote number sense?

23 And on the other hand, when they do math
24 well, number sense is kind of a byproduct of learning
25 math.

26 DR. FAULKNER: Bob wants to speak to this

1 issue, Bert, so I'm going to let him go first.

2 DR. SIEGLER: Right. So I'd like to tell
3 you about some of the research that supports the
4 importance. This particular comes from understanding
5 of fractions.

6 You ask children what's a bigger number,
7 .43 or .367. Large majority of fourth, fifth, even
8 sixth graders will say .367 because it has more
9 numbers. You ask them where does .034 and .34 go in a
10 number line. They put them at the identical location.

11 So the way in which number sense is understood, and
12 place value is a key part of number sense, is that
13 because the children don't understand the decimal
14 system and place value, they make these very basic
15 mistakes.

16 They also make similar mistakes in
17 fractional arithmetic, because they come up with
18 answers where you're adding two fractions and you come
19 up with a number that's smaller than either of them.
20 It just -- it's all over the place. But the lack of
21 understanding of the place value system leads to this
22 lack of number sense, certainly with fractions.

23 DR. FAULKNER: Are you on the same subject
24 or a different subject?

25 DR. WU: Same subject, same subject.

26 DR. FAULKNER: Bert, are you on the same

1 subject or --

2 DR. FRISTEDT: Totally different. Let him
3 go first.

4 DR. FAULKNER: Okay.

5 DR. WU: I don't know if I'm
6 misinterpreting this, but I think the -- debate of the
7 evening and that is quite different. What Liping is
8 saying is that numbers -- now how do I express it. I
9 carry your version and now I try to interpret it.

10 What Bob would like to see is number sense
11 as in do we understand the Hindu-Arabic numeral
12 system, which is a particular representation of
13 numbers.

14 So it's a decision we can make whether we
15 want to define what number sense is. If we define
16 number sense to be understanding of the numeral system
17 that we have, then of course number sense is correct.
18 But Liping is saying that we have been handed numbers
19 we -- with or without the Hindu-Arabic number system -
20 - Therefore, what are you talking about? So that's
21 the issue.

22 DR. FAULKNER: Okay, Bert. Or no, Vern.
23 Are you talking on the --

24 MR. WILLIAMS: Same subject.

25 DR. FAULKNER: -- same subject? Okay.

26 MR. WILLIAMS: Prior to this Panel I'd

1 never heard of number sense, had no idea what it was,
2 and still don't. And second of all, I think we should
3 probably call it conceptual understanding instead of
4 number sense. If you want teachers to pay any
5 attention to this document, you have to put in terms
6 they know. And number sense just is not going to make
7 it.

8 DR. FRISTEDT: My comment's slightly
9 different. Not that I disagree with what Vern said.
10 Two things. One is estimation should come after
11 people know what they're doing exactly. And so I
12 worry if estimation is emphasized too early.
13 Secondly, and I had this objection with Conceptual
14 Knowledge and Skills as well as here, estimation fits
15 so naturally with inequalities, but the connection
16 doesn't seem to be anywhere in anything we've done.

17 DR. FAULKNER: Skip?

18 DR. FENNELL: Well, I disagree with Vern
19 and I guess I disagree with Liping. I think number --
20 I think that the goal of kids, in particular in the
21 learning of mathematics prior to algebra, ought to be
22 a robust sense of number. And I would define that as
23 being proficient in the kinds of algorithms and
24 procedures we talked about in our critical
25 foundations.

26 I would define that as having a sense of

1 where those numbers that Bob talked about fall in a
2 number line, be they decimal representation or mixed
3 fractions and decimal representations with common
4 percents, or whole numbers early on or what have you.

5 I would also define that as the ability to estimate,
6 whether it's the ability to estimate number of people
7 who happen to be in this room, magnitude, or use
8 particular procedures to get at something that's
9 close.

10 Now all those together, to me, gives kids
11 a sense of how to use number, whether I need to
12 accurately compute the thing or I -- or an estimate
13 will work, and so forth. There's a lot of things that
14 go into that. I would recognize sort of that this
15 sense of number is a culmination. And it doesn't
16 happen overnight, but I think it's critical for all
17 kids.

18 DR. FAULKNER: Wilfried?

19 DR. SCHMID: Well, I mean I completely
20 agree with what Skip said. And number sense includes
21 -- is not entirely a matter of the system, decimal
22 system of numerical expression. I mean the question
23 of -- is $7/8$ ths, I mean is -- how large is this number
24 approximately has nothing to do with decimal
25 expression. So Skip has it exactly right. Number
26 sense is a big package.

1 And then I would say, you know, I -- to
2 Vern, I got involved in math education in 2000. Prior
3 to 2000 I had no idea what people meant when they said
4 number sense. But since I've been in this game, at
5 least to me it seems that this is widely understood at
6 this -- at the elementary school level and is
7 terminology that exists. I mean whether or not I like
8 it -- at this point becomes irrelevant. As Liping
9 said, it is terminology that exists out in the
10 schools, and it's not terminology that's harmful.
11 It's maybe not the one I would choose, but it exists
12 out there. It's being used, it's widely understood,
13 and we certainly must use it in our report.

14 MR. WILLIAMS: I'm probably in my own
15 little part of the universe, because I just disagree
16 with that. I don't think it's understood. When I get
17 a term number sense, I just get this bizarre something
18 about numbers and they just sort of know more than
19 maybe I think they know about what numbers mean. But
20 I don't -- to come through that with knowing how to
21 deal with compilations and understanding why those
22 operations work and -- just a conceptual understanding
23 of mathematics.

24 Number sense is just this vague weird thing,
25 that if we don't write two pages on it it's just going
26 to go in one ear and out the other in the teacher

1 world. Maybe it's just where I teach in Fairfax
2 County, that we've never heard of it, but we just
3 haven't.

4 MR. WILLIAMS: It's Virginia.

5 DR. FAULKNER: Have we more to discuss on
6 number sense?

7 DR. REYNA: Yes. I would, please.

8 DR. FAULKNER: All right. Val?

9 DR. REYNA: As a possible way to reconcile
10 these points of view, I agree number sense sometimes
11 can seem vague to people. How about the following
12 definition? "Number sense" -- we could put it right
13 after that as the -- "has accurate intuitions about
14 numerical magnitudes as exemplified by performance of
15 the following tasks." And then you give examples of
16 the place value, and so on and so forth, those
17 operational ways to assess this accurate intuition
18 about numerical magnitude. Would that help?

19 DR. WILLIAMS: That's one element. I mean
20 that's not all of it.

21 DR. FAULKNER: I don't think we can work
22 this here at the table.

23 (Simultaneous conversation.)

24 DR. FAULKNER: You all -- those of you who
25 care, can work --

26 (Simultaneous conversation.)

1 DR. FAULKNER: I --

2 (Simultaneous conversation.)

3 DR. SCHMID: Could we have a word from the
4 dean of a school of education that number sense is
5 commonly understood terminology?

6 (Simultaneous conversation.)

7 DR. LOEWENBERG-BALL: Vern's claim is that
8 teachers don't understand it, not whether schools of
9 education understand it. So --

10 DR. WILLIAMS: Maybe you do want to teach
11 it.

12 DR. LOEWENBERG-BALL: Yes. I don't know,
13 I agree with Skip that it's broadly used. Whether
14 it's broadly understood to mean the things that Skip
15 and Wilfried want to say, I can't speak to that. But
16 it's a very common term. So I think we're probably
17 remiss in not trying to take it on. So --

18 DR. FAULKNER: What I've heard about this
19 is that we ought to take the recommendations that are
20 in D and E and move them to the recommendations
21 section. And then we decide later whether they're
22 important enough to try to keep in the recommendations
23 section. We killed C. All right. We can't kill C?

24 (Simultaneous conversation.)

25 DR. FAULKNER: I thought Deborah's
26 recommendation is we kill C. She said she thought it

1 was a throwaway.

2 (Simultaneous conversation.)

3 DR. SIEGLER: I disagree. I -- so I added
4 the specifics, because someone, I forget who it was,
5 who said they thought it was a throwaway, but I don't
6 think it is at all. So this is Point C, improving
7 young children's number sense. So here's the
8 elaborated form. And I think it has a lot of content.
9 "Improving young children's number sense improves a
10 wide variety of other mathematical capabilities,
11 including the ability to -- including estimation on
12 number lines, magnitude comparison, counting,
13 identification of numerals, and addition."

14 UNIDENTIFIED SPEAKER: That's a very good
15 point though.

16 DR. FAULKNER: Yes.

17 MR. WILLIAMS: But that's my exact point.
18 You just said we could improve a student's number
19 sense. How do you improve someone's sense? It makes
20 no sense.

21 DR. SIEGLER: No, no, this isn't a
22 definition at all. This is an empirical finding that
23 actually by playing numerical board games that are
24 linear, so these are preschoolers, going from zero to
25 10, you get a sense after playing a game like this, we
26 just go through moving a piece on a board, you learn

1 that six is bigger than four and eight is bigger than
2 five and nine is bigger than three. You learn to
3 recognize these numbers.

4 And after playing the game and you give
5 kids novel addition problems that they don't know yet,
6 the kids who played the game with the numbers learned
7 more of the addition problems and their errors are
8 closer in magnitude than kids who played the same
9 game, except instead of five, six, seven you have red,
10 blue, green. So that's how you -- that's one way to -

11 - DR. FAULKNER: All right, all right.
12 Well, we're going to close out here, but what we're
13 going to do then is we're not going to kill C. We're
14 going to move those recommendations and then we're
15 going to leave it to Skip and Bob Siegler to --

16 And who?

17 DR. FENNEL: Wilfried and Dave and that
18 works.

19 DR. FAULKNER: Okay. Well, that crew is
20 going to work out something that actually has meaning.

21 DR. FENNEL: That's good.

22 DR. FAULKNER: Okay.

23 I'm going to move D and E, those two
24 recommendations, to the recommendations. And then
25 later we'll decide whether they have enough value to
26 stand up to the other things that we're considering

1 here. Okay?

2 All right. I have a deep number sense
3 that we have expired.

4 DR. FAULKNER: Yes. So we're going to go
5 ahead and break out -- off now. And for the audience,
6 let me indicate that we're returning here tomorrow at
7 8:15. Those of you who have notebooks here may leave
8 your notebooks overnight. And we'll be back here in
9 the morning, so we're okay.

10 But let me also point out to the Panel
11 that we need to get further down this chart quicker
12 than we're moving. And we have only gotten to three
13 in the first section.

14 (Meeting concluded at 5:05 p.m.)

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