U.S. DEPARTMENT OF EDUCATION
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NATIONAL MATHEMATICS ADVISORY PANEL MEETING
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The meeting of the National Mathematics Advisory Panel convened in Salon ABCD, BWI Airport Marriott, 1743 West Nursery Road, Baltimore, MD, on Wednesday, November 28, 2007 at 8:30 a.m.

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

EX OFFICIO MEMBERS:
IRMA ARISPE
DANIEL BERCH
JOAN FERRINI-MUNDY
RAYMOND SIMON (NOT PRESENT)
GROVER (RUSS) WHITEHURST (NOT PRESENT)

STAFF:
TYRRELL FLAWN, EXECUTIVE DIRECTOR
MARIAN BANFIELD
IDA EBLINGER KELLEY
JENNIFER GRABAN
JIM YUN
HOLLY CLARK

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8:30 a.m.

CHAIR FAULKNER: Okay, let me welcome you all. I'm Larry Faulkner, Chair of the National Math Panel. The Vice Chair is on my left, Camilla Benbow, and we want to welcome the public to this tenth and final working meeting of the National Math Panel.

To begin, I would like to point out that we have signing services available and we can continue with those services, if they're being used. If they're not being used, we will discontinue, with the proviso that we can re-continue upon demand.

So, let me ask if there is a need to continue with the signing services.

(No verbal response.)

CHAIR FAULKNER: If not, then we're discontinuing. Let me also point out that this meeting is being video taped, for a future video of the Panel's work. There is a photographer present as well, and that person will be taking pictures during this session.

The National Math Panel was constituted in April 2006 by Executive Order of the President to review the best available scientific evidence and to make recommendations to the President and the Secretary of Education on ways to improve mathematics learning, with a particular emphasis on Algebra readiness and Algebra success.

This group has been working for about 20 months, reviewing research and considering comments and testimony from hundreds of experts, organizations and interested individuals. It has reviewed something on the order of 16,000 to 18,000 research reports. The Panel is nearing completion of its task group and sub-committee reports, and today, will be engaged in discussion about the current draft of the Final Report.

I would like to point out that you will have -- you and the audience, some of whom are members of the press -- the ability

to review on this screen, text that is in this report at this point. I should indicate to you however, that this document is still very much being worked on and the points and the language are still being debated.

So, the fact that material appears on this screen in such-and-such a way doesn't necessarily mean it will appear in the report in that way or at all. So, I'd urge you to be careful about interpreting what the Final Report would be on the basis of what's in the document at this point.

Let me say that before we begin the discussion of the Final Report, we are continuing to receive reports from the task groups that remain active on their own task group reports, assessment and instructional practices. We will get brief presentations on the current status of these two groups' activities.

Joan Ferrini-Mundy is reporting for the Instructional Practices group and Camilla Benbow will report on the Assessment group.

Joan, let me ask you to make your report. Doug, okay. That's Doug Clements.

JOAN FERRINI-MUNDY: Good morning everyone. We'll just provide a brief report on the progress of the Instructional Practices group, relative to work that we've been under-taking since the last time we reported to you all.

The membership of the group is here and here is the current table of contents for our draft report. As you see, if you've been following the work, we have made a few small changes here. If you take a look -- number four, effective instruction for students with learning challenges.

This is a new title and a new combination of two pieces that were separate chapters previously, the section on learning disabled students and low-achieving students. Those are being combined into a single chapter and that re-writing is happening currently.

Then I should also point out that the section on teacher-directed and student-

centered instruction in mathematics is undergoing some revision as well.

The other chapters have been edited and finalized based on comments from our group and other informal reviews. We expect to be complete with this report in the next couple of weeks.

We also wanted to point out that at the bottom here, you see these italics from Teacher for Teachers, mathematical examples. This is a new section that we're working on with two of our group members, to fill out certain mathematical ideas, relative to the Critical Foundations that are proposed in the CKS report. That is also in progress at this time and our group has been taking a look and working with it.

Today's presentation is going to focus largely on the report that has had, at this point, the most revision, The Role of Technology in Mathematics Instruction, and Doug Clements will do this presentation.

He'll highlight the points that are

essentially new, based on the work that's been done since we last talked about this. There's been substantial revision and new meta-analyses conducted, in order to complete this chapter, and so, I'll turn to Doug to hear more about where this is.

DOUGLAS CLEMENTS: Great, thanks. All right, the report looks at computer software and technology in general, but at calculators as a special kind of tool. I'm going to talk about that separately.

What we did is, after we conducted syntheses of previous meta-analyses and reviews, we found that it was clear that there was a substantive amount of rigorous research only in three categories of software. So, the Panel conducted our own meta-analysis of those three categories.

One of them was drill and practice, and so, what we found in our own meta-analyses, that drill and practice of high quality can improve student's performance compared to conventional instruction.

There are some hints from previous reviews that that effect is higher in computational areas than in concepts or applications, particularly in generating automaticity and basic fact knowledge and the like.

Tutorials also include a good amount of drill and practice. So really, that category should be seen as both tutorials, plus drill and practice. If they're well designed and implemented, they may be useful. We have statistically significant results on math achievement, especially at the junior and senior high level. There were stronger effects with the older kids. It was probably useful to introduce and teach new subject matter as well as content to develop specific educational goals for specific populations.

So, the main report will talk about what kinds of applications are useful as related to specific goals for particular children.

However, a couple of studies that

were within those, especially a recent study by Dynarski, et al., funded by the Institute for Education Sciences (IES), that was just a large scale study, which found virtually no effects, plays an important role, both in the meta-analysis and in the discussion afterwards. It leads us to say that there are real caveats; because care must be taken that the software really does increase learning, but before you adopt any kind of software, realize that all software is not equal. There's very different kinds of quality to various pieces, and you need to find evidence on that particular software.

Just because we're making a general statement about any of these categories, of course, doesn't guarantee that any particular instantiation of that category on particular software is going to be effective and requisite support conditions for effective use have to be in place.

Teachers have to be trained. It has to be integrated with the curriculum and

various things like that, all of which are in the full report.

Turning to computer programming, interestingly, the computer program was the only one where a review of rigorous studies actually led to a higher effect size than the review of syntheses of previous reviews, in that it can develop mathematics concepts, particularly geometric concepts and problem solving abilities.

We did not come out particularly strong for developing calculation abilities or the like, which is not surprising, especially for elementary students. The effects are larger if the environment and the computer software per se, are designed for learning, Logo versus BASIC or other languages. This statement comes from the review of reviews, as well as an individual analysis of those in our meta-analysis.

The effect sizes tend to be larger if student's programming is mediated and guided by teachers to help students achieve

particular mathematical goals. So, a mindless programming is not going to achieve what we found with these effects in studies that were well designed to integrate the programming into some kind of thoughtful supplement to mathematics instruction.

There were insufficient rigorous studies of other categories of software to make recommendations. So, we basically can't say anything about problem solving software, for instance. There were a few studies that seemed to show very small effect sizes. Not enough to conduct a meta-analysis on it.

With other tools, other than calculators, everything from clickers to more recent handheld technologies, to other categories such as simulations, games and various Internet applications, there's just no rigorous research on these things. We await research before we can say anything about those categories.

We already presented the main meta-analysis of calculators at a previous meeting.

So, we thought here, one of the most important things was to try to say, "What are we going to say about these?"

I'm not going to review the many pages of presentations and notes we had in previous sessions on the actual review of calculators. But some new language has been presented.

Wilfred helped out a lot with this language and then Wilfred, if you don't recognize the exact text, that's because Vern was the person who changed it. You can tap Vern next to you and ask him why it doesn't look exactly like what we agreed to, because we were working on it late last night.

One possibility is to say the following, in summary. In a review of 12 studies that met the Panel's rigorous criteria, only one less than 20 years old, calculators have shown limited to no impact on calculation skills, problem solving competencies or conceptual development.

The review of reviews we did

contained hundreds of studies, many of which are more recent. But when you look at the Instructional Practices group's rigorous criteria, the only one that was after 1987 was a single study at ninth and tenth grade. Everything else was before that time.

So, it's important to note that long-term effects of calculators, which many people on the Panel think is very important to point out, have just not been studied. There is possible negative effects of over-reliance or inadequate use, malpractice educationally, use of calculators, just -- we can't say anything about it right now. Not at least, from any kind of rigorous studies.

There was more debate about an implication statement. They can't judge the advantages or disadvantages of long-term use, especially use beginning in the early years, because there's just been inadequate investigations of those.

More debated were these kinds of things that we were trying to say to draw

implications and illuminate some of that, given their limited positive impact in the focal research and considering the Panel's results as a whole.

There are strong arguments for caution in the use of calculators and especially for more targeted and thoughtful use.

Some people thought, in discussions yesterday, that the examples were inappropriate because they're not grounded in the rigorous studies. So, I want to say that as a caveat right up front they should not be used in situations where they may impede the acquisition of basic facts and computational procedures. As substitutes for mental or paper and pencil calculations, they may have long-term effects. We don't know.

Conversely, if they're used, even in the early years, potentially, to verify answers, ensure accurate computations, they could lead to correct association. So, in basic facts, basic addition between the add-

ons and the sum, we don't know. This kind of thing would have to be studied.

The studies are frustratingly inadequate in reporting exactly how long kids use calculators in these studies and exactly what they were doing with those calculators at the time. They may say they used them to solve problems. Okay, were those simple computational problems or were they dealing with numbers that were very large and therefore, they could investigate real world problems that were beyond their paper and pencil calculation abilities at that time? It's hard to tell.

Similarly, they should not be used in situations in which they may interfere with student's understanding of the meaning of fractions and their ability to compute in fractions. Limited targeted use of calculators may enhance student's problem solving ability and their understanding of functions, but students should develop a sound idea of what graphs are and how to use them

independently, and that's the end.

CHAIR FAULKNER: Okay.

DOUGLAS CLEMENTS: With those as the most contentious statements, I'll leave that up there and Larry, did you want to have a discussion or questions now, or as these come back in the full report, did you want to wait?

CHAIR FAULKNER: I don't want to try to get into word-smithing here. But I do want to let people have a chance to comment on this general matter. We'll get back to the report later, okay.

WILFRIED SCHMID: Considering the phrasing on the previous slide, the beginning of the --

CHAIR FAULKNER: Turn the mike on.

WILFRIED SCHMID: I'm Wilfred Schmid. So, considering the phrasing on this slide, now go to the next slide. The sentence, "Given the limited positive impact and focused research," the word positive now really seems out of place.

I think what you're really saying

is the limited evidence, and so, that needs to be changed.

DOUGLAS CLEMENTS: That's a good suggestion.

CHAIR FAULKNER: Other comments that need to be made at this point? Sandy?

SANDRA STOTSKY: My general question would be, if almost all of these studies are pre-1990, one question I would ask is, why we simply shouldn't say these studies are too old to draw any conclusions, period, and be done with it. That would be point one.

Then, a second question would be, for research, why is it the case that there have been no high quality studies done since 1990, because this is what is striking to me, that almost all of them are before 1990, which is before the major use of calculators ever became an issue in the schools. Why is there no high quality research since 1990?

DOUGLAS CLEMENTS: There are a variety of reasons for the latter, and any answer I would give would be conjectural at

best. But let's talk about your first question first.

Why report it? First of all, it's not always true that just because research is older, it's worse or it has no implications for us in the present day. Piaget still illuminates some issues, regardless of it being more than half a century old in some cases.

With regards to the long-term use or different kinds of use, it is frustrating not to have more recent studies, there's no doubt about it. I would not agree that just because a study is old, it has no implications. I think it's good to see what the implications are from studies, even the old studies. It gives direction to the field to both tell them, "Come on, let's get back to some good causal studies here," and also, "Let's ameliorate some of the weaknesses and disadvantages of those earlier studies." As I was saying before, they don't look at pedagogical application and delineate the

different ways calculators should and should not be used. I think this research corpus does both of those.

It says, "Listen, all we have are older studies." It's a challenge to the field to do that. It's a challenge to the field, like I say, to ameliorate some of the gaps in the design of those earlier studies, and recall that it's not that no studies have been done. We had certain criteria. It's unfortunate that some of those studies didn't meet those criteria.

The interesting news is, that most of the rigorous studies, even though they're old, were substantially, if you read the report, in agreement with a lot more recent studies that were covered in other meta-analyses.

Those meta-analyses included studies that did not meet the rigor of our group's criteria. But the fact that the results of those studies are pretty consistent with the older studies, would tend to indicate

to me, to at least give some direction that there's been no substantial change in the kind of effects that we're getting from the calculators.

CHAIR FAULKNER: We have Wu, then Tom, then Vern, and it looks like Russell.

HUNG-HSI WU: I would like to follow up on Sandy's point about the fact that it's not a matter of whether something is dated or not dated, but rather, the issue really arises in recent times, the long-term effects particularly.

So, I think her point is valid that, there should be a qualification about the fact that these are pre-1990 studies, therefore, they are really not indicative of all the problems that arose from the long-term use and for example, the e-mail that I circulated from the Minnesota chemists.

Now, that's certainly not research. It's limited in scope. Never the less, that's something that would really set off an alarm. They didn't set out to do any research,

but the results they get just tell you that there is a problem.

DOUGLAS CLEMENTS: Yes, and that's why we put in these caveats that they can't be used because the long-term, beginning in the early years, hasn't been studied. It's a real warning.

But the fact remains that despite the chemist article and many people's opinions that long-term calculator use has had a pernicious direct effect on kid's calculations skills, I would claim that we just need better science to know how much we can attribute the problems to specific calculator use.

A child picks up a calculator in high school to do seven times eight. We know something is radically wrong. But picking up the calculator may be a sign that something is wrong, but not necessarily the entire, or even a significant part, of what went wrong.

What went wrong may have had a hundred other causes, including lack of good mental arithmetic, lack of teachers who were

dedicated to it, lack of policies to give mathematics enough time.

So, I think you're probably right, but I don't think we can claim, based on any science, that we know what proportion of the variance in these kinds of problems were caused by long-term calculator use. It's an open question.

HUNG-HSI WU: Just short follow up?

CHAIR FAULKNER: Short.

HUNG-HSI WU: Yes. This, unfortunately, weighs into what we're going to do later about the point itself. I agree with you, there should be some caveat. But I feel that the caveat could have been phrased in a better way, such as, what Larry does with the -- the thing about teacher's common knowledge, which is, I think, it's extremely well phrased, where the caveat is up front.

DOUGLAS CLEMENTS: Yes, we're very happy to look at the caveats and have other people give suggestions, in terms of what that would say. This was largely from work we did

with Wilfried, but it hasn't been vetted to the group or the whole Panel and other contributions are welcome.

CHAIR FAULKNER: The Chair is getting nervous. Tom?

TOM LOVELESS: I'm glad that we're pointing out the lack of research, in terms of long-term studies and also, the fact that the research is dated.

The third thing that I would like to see stressed more emphatically is that most of these studies are with older kids. There are very few calculator studies, especially the high quality ones, that are before third grade, of those 12 studies.

DOUGLAS CLEMENTS: Only one had even a second grade, and that showed a negative effect at second grade.

TOM LOVELESS: That's right.

DOUGLAS CLEMENTS: And that's significant.

TOM LOVELESS: What concerns me about this particular slide is the only

mention of the early grades here, which is down about the fifth bullet or something, casts calculators in a potentially positive light.

DOUGLAS CLEMENTS: Yes.

TOM LOVELESS: I'd rather have us say that we really don't know and for those who are concerned that calculators may interfere with the acquisition of basic skills, most of which occur, of course, in grades K through three, the fact is, the research just can't answer that question.

DOUGLAS CLEMENTS: Right, that's why beginning in the early years here was supposed to be the kind of wording that would imply that there's a real danger in the early years. As you know, because you wrote some of the text, the full report talks about the problems when kids are just performing those calculation procedures.

TOM LOVELESS: I'd like to see --

DOUGLAS CLEMENTS: So, we can try to re-phrase.

TOM LOVELESS: I'd just like to see that rise to the level of limitation of the research.

DOUGLAS CLEMENTS: Right, great. Vern?

VERN WILLIAMS: So many points to make. Some of the studies actually involved having students check their calculations. So, if you're having students calculate and then you use the calculator to check those calculations, of course, that's not going to have an effect on calculation skills.

But yet, in the first sentence, it's implied, when you just say calculator use, this isn't brought out, and I think more needs to be brought out in the first sentence. That's one point.

Another point is, these studies were made prior to 1990 and in 1990, there was a sea change in the mathematics world. It's called the NCTM standards. Computation was definitely de-emphasized.

So, I would say, with the increased

use of calculators, along with de-emphasizing computation skills, it's hard to make a statement, based on prior 1990 studies.

There's a third, fourth and fifth thing, but I'm going to let the other Panelists say something first.

CHAIR FAULKNER: Okay, Russell?

RUSSELL GERSTEN: This is really just a point of information, that -- because my mind was blurring between the technology and the calculators, and you covered a lot of material very quickly, that the situation in technology is different, in that probably, one of the most rigorous studies was completed within the last six to nine months.

So, we are facing, at least in terms of studies of software use and their impact on student math achievement, kind of a change the other way to rigorous research that's on a much larger scale than any of those studies. So, the two areas are different. It's easy to blur them.

CHAIR FAULKNER: Okay, more? Bert?

BERT FRISTEDT: I'm concerned about how people read what they see. The calculator issue is a big issue with parents and teachers, generally.

The issue for them is that it is important for students to learn how to do addition, subtraction, multiplication and division, say of a three-digit number and a two-digit number. The CKS part of our report says this is important.

Reading about the calculator, the issue that's going to cross a parent's mind is, how does the calculator interface with the ability to, at some point, be able to do that with pencil and paper. The research questions that we're asked in these studies are much narrower than that.

In some sense, shouldn't the very first thing that's mentioned be this main issue that a lot of the people in the public are concerned with, and then be more specific about what kinds of studies there were?

CHAIR FAULKNER: Okay, Wade, do you

want to comment on that?

DOUGLAS CLEMENTS: No, that's great.

A. WADE BOYKIN: Just a quick point. It seems to me that the time dimension may also come into play with the realization that what a calculator can actually do has changed greatly across times, more sophisticated.

It can do more things with a child or for a child. I wonder if that has been taken into account at all in this discussion.

DOUGLAS CLEMENTS: The synthesis of other meta-analyses and reviews discusses that, to a limited degree. But there just hasn't been enough research in computers or in calculators that look at specific features of the hardware or software environments and what they do or do not contribute. It's another thing we put in there as recommendations.

A. WADE BOYKIN: My point, just simply again, is that a calculator 20 years ago may be different than a calculator in 2007. So, that's just another qualifier.

DOUGLAS CLEMENTS: Sure.

CHAIR FAULKNER: Okay, I think the purpose of this discussion is really to advise IP on the completion of its report, but it obviously spills over into what we say in the document we're working on right now.

With that, let me turn to Camilla Benbow, to talk about Assessment. Thank you, Joan. Thank you, Doug.

CAMILLA PERRSON BENBOW: I'm going to be quick and brief, because I think everybody is eager to get into our main report, and we have reported out, several times before. I am not going to go through our whole methodology and how we reached these conclusions.

What we have been doing, since the last time we reported out, is refining our recommendations. What I'm going to put up here are the final recommendations, and that is all that I'll be reporting on. So, it's the new things that have happened since St. Louis.

If you recall, we looked at

National Assessment of Educational Progress (NAEP) and state tests and we looked at those tests because they're very important today, in evaluating the outcomes of education for individuals, schools, states and for the Nation.

Because they're evaluating the outcomes of education, they can, of course, also drive the educational process. If that's what you're being evaluated on, well, people will teach that. So therefore, it's very important that we look at these tests to see, do they measure what is important and how well do they measure it? Is there quality and accuracy in our instruments?

So, the two general recommendations that came out of our group is the first one that NAEP and state tests must focus on the mathematics that students should learn, e.g., those that the Conceptual Knowledge and Skills Task Group identified as important by the National Math Panel, and with the achievement on critical mathematics content reported and

tracked over time.

That's our first recommendation and we'll drill down a little more deeply to see what we mean by that, and a second general recommendation is that states and NAEP need to develop better quality control and oversight procedures to ensure that test items follow the best-item-design principles, are of the highest quality and measure what is intended, with non-construct relevance, sources of variance and performance minimized. Those are our two general recommendations.

Let’s look at what's important to measure. We looked at the NAEP primarily, but it has implications for the state test. We looked at six state tests. But you know, their content strands were rather similar to the NAEP. So, therefore, if you look at the NAEP, it has implications for state tests.

We looked at the NAEP and we tried to develop several principles for re-organizing the NAEP's five content strands to better reflect the conceptual knowledge and

skills identified by the National Math Panel as important and was also found in the literature. What I'm talking about here is that these principles, when you apply them, could lead to the following recommendations.

In terms of measuring what is important, we felt that at the fourth and eighth grade level it is very important that the measures look at whole number operations and fractions. Of course there should be a little bit different emphasis at grade four than at grade eight.

We felt that the current number properties and operation strands of the NAEP ought to be re-named. It should be called number and it ought to be divided into two separate strands.

At grade four, one strand should be whole number operations and a second separate strand is operations involving fractions and decimals, again, to highlight the importance of these types of concepts and skills at this level.

At grade eight, you can see that again, we should divide it into integers and then fractions, decimals, percentages and related applications involving ratio, rate and proportion. So, this is what we felt was important to measure.

Again, if you want to drill down a little more deeply, here is the whole number strand and here is the fraction strand.

One of the major concerns that emerged is that fractions and whole numbers haven't been assessed as deeply as we think they should be, and we're trying to correct that.

We looked at geometry and measurement and we felt that ought to be combined into one content strand, and we felt that topics related to both measurement and geometry should serve as important context for problems within the grade four and grade eight NAEP.

Now, with regard to algebra, we felt that this was a very important principle.

That is, a better balance is needed within the algebra sub-topic of patterns, relations and functions, and that there should be much less emphasis on patterns. Algebra is too closely aligned with patterns, and that needs to be de-emphasized in the tests.

Again, on data analysis and probability, we felt that at the fourth grade level, it really needed to be seen as data display. At the eighth grade level, the data analysis and probability name is appropriate, but the content should be expanded to include both data interpretation and probability.

So, those were sort of the principles and ideas that, if we were going to re-organize the NAEP and have it be consistent with the Conceptual Knowledge and Skills group.

Having decided what would be the appropriate content, the next step was to look at how well should students do at grade four and at grade eight? What are the appropriate performance levels on these strands?

So, we did not actually go through it, to make decisions about where to place the cut score. We looked at how you go about setting a cut score.

so, again, the modified Angoff method seems to perform well against several criteria for psychometric adequacy.

One of the other things and an important point was that in terms of having the panels that come together to set the cut scores, that determine proficiency levels, we really felt that it should, of course, include teachers and that teachers are necessary in the process, but that it should also draw on expertise of high level curriculum specialists in education and academia. If it's just teachers, that would be insufficient.

We also felt that it was really important that before the standard setting panelists set about their work of setting cut scores, that they actually took the tests themselves, to have a sense of that test. We also felt that the standard setting should be informed

by performance data.

Again, something that you've heard over and over again is there isn't as much research as we would like to inform this process in our recommendation. So, more research is needed.

Okay, now, we move into that second part, about quality control and oversight procedures. So, we've looked at, what do you measure? How do you determine what is a passing score or not, and now, let's look at the accuracy of our instruments.

So, one of the recommendations that is coming out of this is that items should be designed to assess specified aspects of task performance. Well, how did we look at that aspect?

One of the things that is of course a debate is the value of multiple-choice questions on tests versus constructed response. There are many different types of constructed response items. But there is a feeling out there that constructed response is just a better way to go

about it.

The research did not support the notion that constructed response format measures different aspects of mathematical competency, compared to multiple choice.

The important implication of this is not whether to select a multiple choice rather than a constructed response format for your test, but rather, have the most efficiently designed items to measure content of the designated type and level of cognitive complexity. We recommend focusing on what it is that you want to measure, not whether you use a multiple choice or a constructed response.

Also, a very important issue is that much more attention should be paid to the mathematical knowledge that is being assessed by a particular item and to the extent to which that item addresses that knowledge, rather than non-construct relevant variance.

We saw a lot of problems in this area. I know as basic as this may seem, this seems to be a gap in the test development process. We actually

found seven types of flaws in the mathematics items that could introduce non-construct relevant variance. Therefore, you may not be measuring what you think you're measuring. And so, we delineated those seven types of flaws, in terms of highlighting what people should be on the lookout for.

Because we found all of these flaws in the mathematics of the items that were being used in the NAEP, we strongly recommend to the NAEP validity study, that mathematicians, along with mathematics educators, should be included in greater numbers in the review and design of mathematical item content for state, NAEP and commercial tests, as well as for setting performance standards.

I don't think we can emphasize this enough, how important it is to include mathematicians and mathematic educators in the item writing process and pull out those items that are mathematically flawed.

We of course, looked at calculators and should students use calculators on tests, and

after looking at the literature, we came to the conclusion that calculators should not be allowed on test items that seek to measure computational skills. They may, perhaps, be allowed on problem solving, but not on computational skills.

You know, of course, as we were looking at word problems, these issues here became salient, but because we're running out of time, I'm not going to go into them. There are probably other things that you need to look at, in terms of item design. But these are some thoughts that people may want to have, in terms of writing items, especially word problems, which tend to be problematic.

Here is a conclusion about research. Again, we had lots of questions we wanted to ask and explore and the literature just wasn't there to really explore them in depth or in a way that we wanted to explore the literature. Much more research is needed on item design and test design features to help us make stronger conclusions. We have another recommendation. Word problems are important and useful, but they're also likely to

introduce non-construct relevant variance in them. That's our set of recommendations.

CHAIR FAULKNER: Thank you. We've got Skip. I've got Doug. I've got Bob. I've got Wu. Who else?

FRANCIS “SKIP” FENNELL: Just a point of clarification, relative to the two suggested content areas. At grade four, they would begin working with whole numbers and move into operations with whole number fractions and decimals, not including to any great extent, operations.

At the eighth grade level, integers would include all work, with all integers, including all of the operations and numbers, fractions and decimals and related percent.

CAMILLA PERRSON BENBOW: Thank you.

CHAIR FAULKNER: Okay, Doug.

DOUGLAS CLEMENTS: Did you establish, for the professionals that you're advising to take these tests, the cut off score, under which they wouldn't be allowed to comment on the test?

CHAIR FAULKNER: They can't use

calculators.

DOUGLAS CLEMENTS: Yes, exactly. I know we're not supposed to wordsmith, but in the same way with the calculator stuff, we've got to be careful of the implications.

NAEP and state tests must focus on the mathematics that students should learn, e.g., the conceptual knowledge and skills identified as important by NMP.

A main focus should be on those things we've identified that lead to algebra, but that's not the entire elementary curriculum, we keep saying, and I'm not sure that message would come through with your present wording.

CAMILLA PERRSON BENBOW: Okay, Skip, why don't you go at it?

FRANCIS “SKIP” FENNELL: Okay, what we're trying to do there, Doug, is to ensure that those foundations are covered.

DOUGLAS CLEMENTS: Right, okay.

FRANCIS “SKIP” FENNELL: But as you know, in a national assessment like the NAEP, other mathematics will certainly be part of that.

Our concern there, perhaps my personal opinion, is that use of the word “ensure,” that the foundations are covered, is the intent.

DOUGLAS CLEMENTS: Okay.

CHAIR FAULKNER: We are going to get back to that, because that very language is in the --

DOUGLAS CLEMENTS: Right.

CHAIR FAULKNER: -- in the document that we'll be looking at.

DOUGLAS CLEMENTS: Okay, because the other text is also measurement and geometry, to serve as good context. True, but it seems to limit them to context.

CHAIR FAULKNER: Right, yes.

DOUGLAS CLEMENTS: I don't think that would be appropriate.

CHAIR FAULKNER: That's not the intent.

CAMILLA PERRSON BENBOW: Anything else?

CHAIR FAULKNER: Bob and then Wu and then -- did you want to come back, Skip, because you signaled?

FRANCIS “SKIP” FENNELL: I'm ready to

come back on any of this.

CHAIR FAULKNER: Okay, well, let's get --

FRANCIS “SKIP” FENNELL: Let's go.

ROBERT SIEGLER: I think one of the most important recommendations here and one that I totally support at the eighth grade level, is the separate strand for measuring knowledge of fractions.

I have pretty strong belief though, based on the Learning Processes group’s review of the fractions literature, that in fourth grade, you're going to get floor effects. For sure, you're talking about kids comparing the magnitudes of fractions, even sixth graders are just awful at that. Unless instruction would drastically change, those items would be wasted.

CAMILLA PERRSON BENBOW: Actually, Tom and I discussed that this morning and it would be very elementary at the fourth grade level. The really important part of the fraction strand is at the eighth grade level.

FRANCIS “SKIP” FENNELL: These are

building blocks or rational numbers at grade four.

CAMILLA PERRSON BENBOW: Yes.

FRANCIS “SKIP” FENNELL: I agree with you, relative to sort of extreme kinds of comparison kinds of items. But at the same point, we think we'd be amiss, if we didn't assess the sort of beginnings of that. Bert and I have had a number of conversations, as to what that math might look like.

CAMILLA PERRSON BENBOW: Also, the other point is that with the state tests, they are going every year and they can be tracking. And so, you wouldn't want to have the state test not measure anything until eighth grade. You probably would want them to start a lot earlier.

ROBERT SIEGLER: Yes, but at fourth grade, children can't even do problems like, “Which is larger, three-quarters or one-eighth?” The vast majority of kids don't know those kinds of problems.

CAMILLA PERRSON BENBOW: We understand.

CHAIR FAULKNER: Go ahead and follow up, Tom.

TOM LOVELESS: If I can just respond to that in a comment. Currently, of course, NAEP claims that it assesses algebra at fourth grade.

CAMILLA PERRSON BENBOW: Yes.

TOM LOVELESS: So, the leap to assessing at least the rudimentary understanding of what a half is, what a third is, is not really out of the reach of most fourth graders, as opposed to the idea of doing algebra at fourth grade.

But your point is well taken and really, when we discussed this in our group, the really important thing we wanted to convey was the fourth grade test needed to focus on operations and understanding of whole numbers. That burden would then shift, in terms of fractions at the eighth grade level.

CHAIR FAULKNER: Okay, Wu is in line here. Can I go ahead and let him do that, and when we'll come to Wilfred and then Russell.

HUNG-HSI WU: Okay, can I turn to the page on item and test design, item B? The one on multiple choice and let's see --

CAMILLA PERRSON BENBOW: Here is it.

HUNG-HSI WU: Yes, constructed response. Now, I would challenge that wording because I think you're saying it doesn't matter which one you use, so long as you do it well. I think that's roughly the message.

All right, I would strongly suggest that we phrase it differently, that they shouldn't have both, because they're different and each one is needed to assess a person's mathematical competency.

There is no way a multiple choice item can test a student's sequential, logical thinking, which is the main issue in doing mathematics. I think this really should be re-phrased.

CAMILLA PERRSON BENBOW: Well, let me --

CHAIR FAULKNER: Susan, do you want to respond to that item?

SUSAN EMBRETSON: Yes, I sure do. It depends on the design of the multiple-choice item. You can make kids have to actually produce an answer, if your distracters include all the wrong

answers that you could get.

And so, the design of the multiple choice can be quite flexible and in a study that designed them that way, in fact, the multiple choice items became more difficult than the constructed response.

Now, a related thing is, people think that there's a different strategy by which kids solve constructed response items versus multiple choice. Well, the example I just gave you, they cannot, because of all those distracters that have wrong answers that you can get, if you didn't go through all the calculations.

But another study that we saw, that was very interesting, was that kids were able to apply strategies that they have learned with multiple-choice items to constructed response.

One comment you often get about multiple choice is that all they have to do is to plug it in to whatever is in the stem and then they can figure out if that's the right answer or not.

Well, in one study that was especially

interesting, they had the same stems and what happened is that when the kids got the constructed response, they started generating answers and plugging them in. Now, we are getting back to the same strategies.

So, this suggests to me, that the context of the whole test might be very important in strategies as well. When you have a test that is both constructed response and multiple choice together, strategies develop for solving items and there's going to be a mixture with what kids do on the different item types.

So, the data were very complex on constructed response, but in no case, did we see clearly that they were measuring something different.

HUNG-HSI WU: I need to respond to that.

CHAIR FAULKNER: Go ahead.

HUNG-HSI WU: The focus is not on the answer. The focus is on whether you have the opportunity to observe what the intermediate steps are. That is the critical issue and there's no

way to avoid that issue by saying that I can figure out ways that would force a student to go through something, so that he can get the answer. By getting the answer, you know that the person is capable of doing sequential thinking.

We want to see the sequential thinking on paper and make judgment. That is the issue.

CHAIR FAULKNER: Camilla, do you want to comment?

CAMILLA PERRSON BENBOW: I think what we're saying here is actually pretty similar to what you're saying with regards to efficiently designed items measuring content of the designated type and level of cognitive complexity. If you have a reason for designing your item in this way, then you should do a constructed response.

But you shouldn't just blindly do constructed response because you think it's a better way of doing it. You can actually do multiple choice to get a higher-level thinking.

But when you have a situation -- what you're talking about here, where you have exact rationale of what you're looking at and what

you're wanting to do, fine. But --

HUNG-HSI WU: Yes, but the message comes across saying, either will do and if you do it well, then you can almost get all of the assessment.

Now, if I misinterpreted, then you should change it. I'll give you a very, very clear cut example, which is, of course, not grade appropriate because it's beyond grade eight.

A multiple-choice test can in no way test whether a person can do a geometry problem, period.

CAMILLA PERRSON BENBOW: I think, actually, we'll look at the wording of that, because that's what we were trying to get at with that second sentence. We want to say don't focus on the issue of multiple choice or constructed response, but rather, what it is that you're trying to measure.

HUNG-HSI WU: No, I would prefer to say that you need several constructed response items to test whether the students are able to navigate the sequence of steps. That's a different

emphasis, so we can debate that later.

CHAIR FAULKNER: Well, I think what we're doing here is advising this task group. So, I think the issues are before them. We've got Wilfried and then Russell, then Wade, then Bert, then Vern, then Skip and at the end, we're stopping after Skip.

WILFRIED SCHMID: Well, I'm always looking. If I can find a point of disagreement with my friend Wu -- I think I've found one. Namely --

CHAIR FAULKNER: Not the first.

WILFRIED SCHMID: Not the first. You see, you also have to think about how these tests are actually scored and I have seen probably more questions than you have. I have not the slightest doubt that if you try to check on NAEP or a state test, whether an eighth grader can do a geometric proof, there is no way that is going to be scored competently. Therefore, your objection, I think, is practically irrelevant.

HUNG-HSI WU: Well, I think --

WILFRIED SCHMID: Let me continue. So,

then I would also like to bring up Bob Siegler's point and I think that of course, his point is well taken, important and I think it can be dealt with perfectly well in the text. Namely, in the text, it must be pointed out that we are also talking about state tests, that therefore, at the state test level and in sixth grade, for example, obviously, there can begin to be some substantial questions on fractions.

But it should also be said that fractions at the fourth grade level can only be expected to be very rudimentary, and I don't believe that has to be put into the recommendation itself, but it must be spelled out more clearly than it is in the accompanying text.

HUNG-HSI WU: But that's the -- I want to follow up that they've been saying that about the participation of mathematicians at all phases. The scoring that I've seen, not in NAEP, but in practice, is quite a bit. . .

WILFRIED SCHMID: But you want to -- do you want to score NAEP?

HUNG-HSI WU: I'm sorry?

WILFRIED SCHMID: Do you want to score NAEP items with constructed response for geometric proofs?

HUNG-HSI WU: No, no, no. But if you want to test a person's -- this is without a doubt.

WILFRIED SCHMID: Okay.

CAMILLA PERRSON BENBOW: Obviously, we knew that this was a hot button issue.

RUSSELL GERSTEN: This isn't as juicy an issue, but what Bob raised and Wilfred also joined in, is an important issue about a grade four fractions scale on a national assessment, that, just as a psycho-metrician, you need quite a few items for it to be reliable and you need, as Bob says, a range of performance.

So, the recommendation is to have fractions, rational numbers, an important part of grade eight. I've heard enough to encourage states to assess fractions, rational numbers in grades four, five, six, very carefully, but not for the NAEP to have a reliable, nationally reported sub-scale on that. It doesn't seem

feasible, given the kind of items you're talking about.

If the kids are just interpreting what an eighth looks like, you can have 12 items on that -- something so basic, that has the whole weight of whole number concepts and operations.

CHAIR FAULKNER: Tom is going to interject here.

TOM LOVELESS: Russell, just one quick follow up. When we use the term fractions, we're really talking about rational numbers. So we're including decimals, for example, and third graders and fourth graders study money. And so, money is another concept that would fall into this strand.

ROBERT SIEGLER: But even there, fifth and sixth graders, when they're asked, "Which is bigger, .345 or .67," consistently say .345, because it has more numbers.

So, even with decimals, I think at grade four, the knowledge is so low that it certainly doesn't pay to make it a separate strand.

TOM LOVELESS: I agree, but money isn't

going to go to the thousandths place, so you're not going to run into that problem.

CHAIR FAULKNER: Well, it does in some places.

TOM LOVELESS: Although with the falling dollar, maybe it will.

CHAIR FAULKNER: Just a quick item on that, Deborah.

DEBORAH BALL: It's just a signal of something I think we're going to have to deal with across the day which is, we can't make claims about what kids can't do under conditions where instruction hasn't been appropriate.

This was something we talked about at our first meeting, and we're going to have to keep dealing with that. Children of this age are capable of learning that, and I think we have to be careful with the tone we're taking. It sometimes sounds as though kids can't learn these things when, in fact, our Panel is about producing the best recommendations we can to improve what they haven't been learning. So, I'd just be careful about that.

CHAIR FAULKNER: Well, I think Bob's message is, they haven't been learning it, not that they can't do it.

DEBORAH BALL: Right, but he can't say, kids of this age can't understand that .345 or whatever it was, is smaller than .67. They can learn that, totally.

ROBERT SIEGLER: I one hundred percent agree. But for a national assessment, we're going to be measuring what they are learning, and I hope that, 10 years up the line, you'll get enough variance in the knowledge of fourth graders that it will make sense to have a fraction strand on the NAEP.

But given what we have this year, and what we even imaginably would have next year or the year after, I think the items would be better devoted to excellent measurement of understanding of whole numbers.

HUNG-HSI WU: But a good item like that would spur learning.

CAMILLA PERRSON BENBOW: That's exactly right.

HUNG-HSI WU: I mean, that's part of the other equation.

CAMILLA PERRSON BENBOW: Yes, it does drive the educational process. So, to have a few items that provide challenge. We didn't say here that the proportion of items in the two strands would be the same at grade four and eight. There may be a difference, but we didn't want to go into saying how much. We want to stay away from that issue.

So that's why you're having this discussion saying, "It shouldn't be emphasized this much." We agree, but we didn't want to say exactly what percentage of items should be emphasizing fractions or whole numbers. We agree with the concept that whole numbers is much more important at fourth grade than fractions.

CHAIR FAULKNER: This is a useful discussion. We need to wrap it up though. Let's get to Wade. Don't forget, we've got a final report to deal with.

A. WADE BOYKIN: Okay, more of a think-aloud comment. Some of the recommendations in the

content and performance level section of the Assessment report seem to have implications for curriculum design, and I guess my comment is, how well are these recommendations synchronized with what is proposed in the Conceptual Knowledge and Skills section? Are we going to be converging these sections?

VERN WILLIAMS: They're very much in line with --

CAMILLA PERRSON BENBOW: Yes --

CHAIR FAULKNER: Vern?

CAMILLA PERRSON BENBOW: -- that drives these recommendations.

WILFRIED SCHMID: Just a comment to Wu. I think you're implying that standardized or multiple choice tests can't fully measure conceptual understanding, and I know this isn't really a K-8 item, but if you look at the American Math Contest (AMC) the AMC-12 is multiple choice, and there's no way that you can do most of those problems without having a full conceptual understanding of the subject matter.

HUNG-HSI WU: And the answer to that?

CAMILLA PERRSON BENBOW: I wouldn't want to.

WILFRIED SCHMIDVERN WILLIAMS: No, it's just that I've built you up at my school as this larger-than-life character. So, I'd like to go back and tell my students that I told you something.

CAMILLA PERRSON BENBOW: Well, I think we have here on the Panel a lot of views that people feel about things, and we were just trying to look at the evidence, and what the evidence says.

We had a big discussion about calculators, and people have very strong feelings about calculators. There are many other topics that people have very strong feelings about, but at the same time, we have to be constrained by what the research says, and sometimes the research doesn't support or isn't there to support our strong views and feelings. I think this is another one of those areas.

So, I think I'd like to leave it out here, because I think we're really starting to

argue about my belief versus your belief.

CHAIR FAULKNER: Bert, do you have a quick item on that?

BERT FRISTEDT: Not on that.

CHAIR FAULKNER: Skip has got the last point.

BERT FRISTEDT: I think he was after me.

CHAIR FAULKNER: Okay, Bert, go ahead.

BERT FRISTEDT: In relation to Bob's point about a separate strand at grade four, we never gave thought to the following fact of putting the two together at grade four, but still splitting them at grade eight.

There seems to be this view that the strands are supposed to be preserved throughout, which does create a problem.

The algebra thing that was on the slide is not quite correct, but I think we can deal with that later.

The one other thing I wanted to mention is that there's some comment in the main report about increasing difficulty -- or at least

indicating that tests should increase in difficulty. I'm very much against that. That's not what the big issue is. It's whether the assessments assess the right things.

If you make a sudden change, in fact, along some of the lines that were discussed here, they're going to be more difficult just because of the sudden change. But the assessments are difficult enough, just for the wrong reasons.

CHAIR FAULKNER: Okay, Skip?

FRANCIS “SKIP” FENNELL: Actually, in response to Bert's statement, we did give consideration. In fact, you could argue that NAEP, as it currently exists in grade four, does combine wholes and work with fractions and decimals, in a very limited way, I might add.

So, what we did, frankly, to highlight the importance of fractions -- defined here as fractions, decimals and related to percent -- is to give it its own bill. We recognize that that work at the grade four level wouldn't be nearly as expansive as obviously grade eight. I really echo Deborah's comments that kids can do certain kinds

of things, and we need to push the curriculum in a way that the kinds of examples Bob cited are far less frequent.

CAMILLA PERRSON BENBOW: Yes.

FRANCIS “SKIP” FENNELL: Second thing I'd like to comment on is partly because Wilfried disagreed with Wu. I'd like to support, in fact, Wu, relative to multiple choice, if you will, versus constructive response items. We never discussed the issue of diagnosis, and that is, what do we know about a kid and his or her learning of mathematics, as we look at those kinds of responses. That's lost in the morass of NAEP assessments and more standardized assessments. They have value, certainly for classroom teachers as they try to get around the thinking that kids use as they come to a response.

I agree with you, from the perspective of instruction, they have tremendous impact and, frankly, always will.

CAMILLA PERRSON BENBOW: Let me just conclude with the fractions. Here are our two general recommendations. I think we drilled down

on each one. But I think one of the things that has come up time and time again, and that influences us with fractions is the importance of mastering fractions in order to be well prepared to handle algebra.

That's something that came up, and out of a Survey of Algebra Teachers, this was one of the areas where students were really lacking. As a result, the principle that fractions are critical preparation in order to succeed in algebra, and the fact that we don't spend enough time on them and we don't assess them, drove us to say that they need to be a separate strand. Schools should be held accountable for this, and it's something we need to track over time. We'd like to see it from fourth grade, very rudimentary, very basic, but in fifth grade, more -- sixth, seventh and eighth, and that we've got it by the eighth grade.

If we're not measuring it, we won't know, until it's all over and done with, whether we succeeded or not.

So I think that's the important question. I think that, out of all the things

we've heard, fractions is really not well mastered by our school children, and we need to do something about that. So that comes into why fractions are a separate strand, conceptually.

CHAIR FAULKNER: Well, that was a nice, short report.

CAMILLA PERRSON BENBOW: Yes, it was. Thank you. We have a very lively group, full of experts.

CHAIR FAULKNER: All right, thank you, Camilla. I think we now need to go on to the Final Report. We have a Wilfried/Wu debate going on here.

I had previously indicated, for the benefit of the audience that we would take this up in blocks, and the first block that we will discuss is the curricular content section of the executive summary.

So, I want to ask you to turn to that section. What I'd like to do is to go point by point and have you talk about those points.

They're going to get it on the screen here, for the benefit of the audience, and for our

own benefit. I'll wait until they get it on the screen. Could you put it in page preview format, so we get numbered lines? I think you need the preview one, yes.

Go ahead to page five.

All right. We now have item one, which is the focused coherent progression. There are a couple of issues that have been raised here. One is the question about circular, spiral or alternative language.

There is an alternative draft over there, that Doug Clements offered, which you can see, it says, "The alternative draft is a focused coherent progression with an emphasis on mastery of key topics should become the norm in elementary school mathematics curricula." No change in sentence one.

"The practice of continually re-visiting topics at the same level year after year without closure should be replaced with an emphasis on a small number of key mathematical ideas (related concepts, skills and procedures) for each grade that build and connect, forming a

cohesive pre-K to grade eight curriculum."

So, that is what needs to be discussed. What is your reaction to point one? Yes, Wilfried?

WILFRIED SCHMID: I think that the word spiral really should be in here in some form or another, because that is what it's usually called in education circles.

It doesn't necessarily have to be the primary description of what we are talking about, but it has to be made clear that what we are criticizing, in fact, very often is labeled as a spiral approach.

Now it's true that, in some subjects, spiral approach is appropriate, but spiral approach, as defined here in mathematics, is noxious.

CHAIR FAULKNER: Skip?

FRANCIS “SKIP” FENNELL: I think we need to define spiral, Wilfred. How do you define it?

WILFRIED SCHMID: The emphasis on a circular approach that revisits topics year after

year, without closure. That is my definition of spiral. I still would at least ask for a parenthetical remark that that's what's often called spiraling.

FRANCIS “SKIP” FENNELL: Okay. I think that's the point of contention, and that is that people define spiral differently. Our issue with the approach is the sort of situation where you never give up on a topic, where, at the grade five level, for instance, you might still be doing addition of whole numbers, when, in fact, an expectation of proficiency should have been before then.

WILFRIED SCHMID: Well, yes, of course, but that is very often called spiraling.

FRANCIS “SKIP” FENNELL: Yes, okay.

WILFRIED SCHMID: And nobody calls it the circular approach. So, that's why I think we should not shy away from using the word.

CHAIR FAULKNER: Liping?

LIPING MA: Yes, I think spiral in education has a specific meaning about what it means by spiral curriculum. It has been in the

field for 100 years. It means that, every time you come back to the same concept, you have a higher level or deeper level of understanding. That's something we didn't carry out.

It's not a problem of this word, but it's the problem of our approach. So, I think we should keep the very meaning of spiral curriculum, instead of just using our own definition.

WILFRIED SCHMID: Yes, but the problem is that, if we refer to it as circular, then it really skirts the issues. I mean, I agree that if you have the mental image of a spiral, and if this is what was truly implemented, then, of course, it would be okay.

But what we see on the ground is, in fact, very often referred to as spiraling by the office, and is what we are criticizing here.

So, I'm not disagreeing with you that, if a spiral approach were really true to the mental image of a spiral, it would be okay. The trouble is, it isn't. The trouble is that various curricula advocate a spiral approach, and the spiral approach is what we describe here in these

additional words.

CHAIR FAULKNER: Wu is next, and then Tom.

HUNG-HSI WU: So, I mean, actually, I think we should poll the administrators to see how they react to the word. I mean, I don't think we're arguing about anything other than what is the normal reaction to the word spiral.

CHAIR FAULKNER: Tom?

TOM LOVELESS: I think we should drop the term spiral because it's loaded. We don't have research that it's bad or good. It can be done well, or it can be done poorly.

Why don't we just use the definition, which I don't think anyone would disagree with, and drop the term? So just say that we urge that topics not be continually re-visited year after year without closure.

CHAIR FAULKNER: Deborah?

DEBORAH BALL: I think that compromise would solve our problem, because what Wilfred said in response to Liping is right.

So Tom's wording solves that problem

because it's that problem of re-visiting and never finishing anything that we're worried about. So if we just avoid the term all together, we get ourselves out of this. I think that's a good solution.

HUNG-HSI WU: I second it.

CHAIR FAULKNER: Sandy?

SANDRA STOTSKY: I'm not sure, because I would have to double check, but I think the word was used in Bill Schmidt's study. I think that is where the original term, as a critical issue, came, and Skip, maybe you remember that better than I do at this point.

But he was contrasting, or the IES study was contrasting, differences in curricular approaches, between what they call the A+ countries and other countries, and that was the term that came into play.

What I would like to suggest as an alternative is that there might be either a footnote or some material added that explains that the spiral approach, as Liping mentioned, works well in science and history in different ways.

In math, as it's been applied to the skill work, it has not worked appropriately. It would not apply even in foreign language teaching, where you're building with skills that must be mastered before you go on.

So, it's been mis-applied in early grades in mathematics, whereas it might apply at much higher levels in mathematics, as it does in science and history, all through the curriculum, but this means sort of looking at every subject in a different way, because each subject has its own requirements and structure.

CHAIR FAULKNER: All right, Wilfried, then Wu.

WILFRIED SCHMID: Yes, well, first of all, I'd like to say to Sandy, I think that even in mathematics, as Liping said, if spiraling really realized, somehow, the mental image of a spiral, it would be okay. But I haven't seen a math curriculum that calls itself spiraling that does that.

Now, when it comes to the actual phrasing here, let's say, if we give up circular,

and if it's true that Bill Schmidt uses spiraling. I mean, Bill Schmidt, after all, is a major source for our, let's say, information about what is being done in curriculum design with international comparisons, then at least I would like to have a footnote that says that this is referred to as spiraling in Bill Schmidt's curricular analysis.

HUNG-HSI WU: I think our Panel report should be as simple as possible and, in fact, that's one reason I prefer Larry's present wording to Doug's, just because it's simple. If we have to add a footnote to explain something, whereas we can do without the footnote by simply omitting that word, just on that basis alone, I would prefer that we just do it.

By the way, Wilfried, there are in fact calculus books, which specifically say spiraling. So, it is used.

CHAIR FAULKNER: I think the question really is, do we convey our meaning here, as to what we're trying to do, and I am going to take us to a vote here in just a minute, actually.

FRANCIS “SKIP” FENNELL: I think the

meaning is conveyed, Larry, with the phrase, should be de-emphasis on an approach that continually re-visits topics year after year, without closure.

CHAIR FAULKNER: Right.

FRANCIS “SKIP” FENNELL: And every one of those words is pretty important. Relative to a footnote, with regard to spiral, spiral is language that is abused a lot in this field, as the interchange said.

I think Wu makes a great point. Here we are in, basically, the first page of any real meat, and we're going to have a footnote. I don't think so. So, I think we need to move forward here.

CHAIR FAULKNER: I think Skip has made a nomination that the language must be changed to a de-emphasis on an approach that continually re-visits topics year after year without closure.

Can I see a show of hands, of how many people are comfortable with that language? Now, how many are opposed to that language?

All right, I'm going to -- pardon?

LIPING MA: It's not avoiding instead of de-emphasize? So de-emphasize --

CHAIR FAULKNER: Let's get rid of circular first. Okay, now, Liping wants us to avoid, instead of de-emphasis. Anybody against avoiding? It's pretty -- there aren't too many takers for non-closure, in my experience.

All right, avoid. We'll do avoid. We'll fix that. Okay.

All right, what about the next paragraph, by the term focused? Are you happy with that paragraph? Okay, all right, then let's go to item two, to clarify instructional needs, and to sharpen future discussion.

We developed a list of major topics of school algebra. Let me ask if you're happy enough with the language in item two, first paragraph. Sandy?

SANDRA STOTSKY: My question is, are we trying to sharpen discussion about the role of school algebra in the curriculum, which I had the sense that everyone understands what its role is. My question is, should it be the nature of school

algebra, what it is, that has been the real issue here, and that it should be the nature of school algebra, not the role.

CHAIR FAULKNER: The nature of school algebra --

SANDRA STOTSKY: Or another word that would mean the same thing, approximately.

CHAIR FAULKNER: But then dropping off, "in the overall mathematics curriculum?"

SANDRA STOTSKY: Right.

CHAIR FAULKNER: Okay. So, it's nature of school algebra. You're happy with that? Okay, then we are okay on paragraph one?

Paragraph two, school algebra --

TOM LOVELESS: How about content, instead of nature? Nature sounds very vague.

SANDRA STOTSKY: Yes, I mean, whatever sharper meaning --

TOM LOVELESS: The content of school algebra.

CHAIR FAULKNER: Okay.

SANDRA STOTSKY: The specific content, or something like that.

CHAIR FAULKNER: Okay. So it's to clarify instructional needs in grades pre-K through eight, and to sharpen future discussion about the nature -- or, excuse me, content of school algebra. The Panel developed a clear concept of school algebra. I think that's repetitive.

SANDRA STOTSKY: You could say the specific content of -- I think that was what Tom was suggesting, or we were together.

The Panel developed a list of the major topics to provide educators with a clear understanding of --

CHAIR FAULKNER: I don't think we need to do all of that.

SANDRA STOTSKY: All right, we said -- Mr. Chair, okay. We were --

CHAIR FAULKNER: Okay, we just developed a list of the major topics. That's all we have to say there.

SANDRA STOTSKY: Okay, it could end there.

FRANCIS “SKIP” FENNELL: About two

hours ago, you said we would not edit --

SANDRA STOTSKY: Wordsmith.

FRANCIS “SKIP” FENNELL: -- word-by-word, this document.

CHAIR FAULKNER: Yes, I know that.

FRANCIS “SKIP” FENNELL: We are on the first page of about a 60-page manuscript.

CHAIR FAULKNER: I know that. We're going to be very slow here, if we keep doing all of this.

FRANCIS “SKIP” FENNELL: Yes.

CHAIR FAULKNER: But okay, well, we've got two suggestions here. What about the second paragraph of this? Are you satisfied with the second paragraph on what school algebra is? Number two, the first paragraph says, "To clarify instructional needs in grades pre-K to eight, and to sharpen future discussion about the content of school algebra, the Panel developed a list of major topics of school algebra, figure one." Yes?

WILFRIED SCHMID: I mean, Sandy, I think on re-reading this paragraph, in fact, I think it should stay the way it is, because what

it is really saying is that, if we want to have a discussion of what should be taught in lower grades, we first have to understand what algebra actually is.

That's what the paragraph says, and I think at this point of the document, that is really the issue. So, I think that actually the paragraph as is makes sense.

SANDRA STOTSKY: The first part or the second part or both? Is that what you're talking about?

WILFRIED SCHMID: Both.

SANDRA STOTSKY: Both? But is it the role that's really in question or the --

FRANCIS “SKIP” FENNELL: Sure, we get the role.

CHAIR FAULKNER: Well, it's the relationship of it to everything else. It's geometry, pre-calculus.

FRANCIS “SKIP” FENNELL: When you talk about algebra in grade seven or eight, you're talking about the role, as well as the nature, as well as the content.

DOUGLAS CLEMENTS: And remember, the role just comes up and to sharpen future discussion about the role. The focus really isn't on the role there. That's just a note, viewed for discussion.

WILFRIED SCHMID: I really think that the paragraph is okay.

CHAIR FAULKNER: All right, I've got two here. How many people are comfortable with the paragraph as it stands? Those who would like to see us fool with it? Okay, well then we're going to keep it.

The second paragraph, I'm not hearing any objection to it. There is a point here that we need to address, and that is that Skip has suggested that we bring forward into the executive summary the actual table of benchmarks. We aren't yet there.

But that question will have to be discussed. If we were to do that and to put them in the document as an aside in the executive summary, or somewhere in the executive summary, we might want to consider doing the same for the

major topics of school algebra. Those are the two blocks of presented material items that we have in the CKS section.

The question I have for you is, do you agree or disagree with Skip that we ought to move the benchmarks forward?

FRANCIS “SKIP” FENNELL: Skip is quite happy to take that off the table, if it moves this process.

CHAIR FAULKNER: No, I think it's an important point, Skip, and I'd like to get a sense of the Panel as to whether the actual Benchmarks and the actual Major Topics should appear in the executive summary, or only one of them, or neither of them. Do you have a sense?

ROBERT SIEGLER: I would include both.

CHAIR FAULKNER: You'd include both, okay.

HUNG-HSI WU: It's either both or nothing.

ROBERT SIEGLER: I'm concerned that, just from the point of view of effective presentation that, having two extensive tables in

the main presentation of the executive summary will delay readers getting to other parts of the report for too long.

So I would favor having it at the end of the executive summary.

CHAIR FAULKNER: Wilfried?

WILFRIED SCHMID: I agree, and I think, in the text, the text that we're discussing now, then there could be a page reference.

CHAIR FAULKNER: Yes, I think that can be done.

FRANCIS “SKIP” FENNELL: When I made this recommendation, which feels like weeks ago, I felt that it could be done within the document in a box on the page so that it doesn't necessarily interrupt, but it provides you with something.

CHAIR FAULKNER: Well, why don't we look and see if that --

FRANCIS “SKIP” FENNELL: I'm not --

CHAIR FAULKNER: -- turns out to be possible?

FRANCIS “SKIP” FENNELL: It's not a big deal.

CHAIR FAULKNER: From a design standpoint, but we're not going to make it a matter of religion, is that okay?

WILFRIED SCHMID: If we have a page number reference.

CHAIR FAULKNER: Yes, we can do that. Yes, Doug has indicated that he thinks that the second paragraph is long. It is long. It appears in this form in the body.

We could trim it down, perhaps, but I haven't made an effort to do that. What is your reaction there?

DOUGLAS CLEMENTS: No disagreement with the content, just with the length.

CHAIR FAULKNER: Yes, well, let's see if we can shorten it. The full version of this paragraph is in the body of the report. So it's not necessary that the whole thing be here.

Okay, Major Topics of School Algebra. I suggest inserting this point, because there's actually no action item that flows from the Major Topics. This is a recommendation that is in the CKS section, and so I've suggested adding item

three.

However, there needs to be some editing because of that, and where it says textbooks, it said, "textbooks for these two levels of algebra," and I had abbreviated this expression of this point, and there's no reference to the two levels. I'm suggesting that it just read, "textbooks for algebra (whether for integrated, curricular or otherwise)" and then, of course, assessments. Okay. Are you happy with that point?

All right, the next point is elementary and middle school curriculum. Should that be curriculum, or should that be curricula?

CAMILLA PERRSON BENBOW: Curricula.

CHAIR FAULKNER: Speaking of fine points, Skip.

CAMILLA PERRSON BENBOW: Curricula.

CHAIR FAULKNER: I should stress proficiency with whole numbers, fractions, and particular aspects of geometry and measurement. These are the Critical Foundations.

Okay, the first paragraph.

WILFRIED SCHMID: Again, there should be a page number reference.

CHAIR FAULKNER: Well, the Critical Foundations doesn’t have a tabular form of this, Wilfried. It's just a list.

WILFRIED SCHMID: Well, even so, even if you --

CHAIR FAULKNER: We can say --

WILFRIED SCHMID: Even if you refer to a page number in the main report, because it's true that you certainly would not want to have it here, but if you make it a major recommendation, then anybody who really wants to know what's being recommended ought to be able to find it very, very quickly.

CHAIR FAULKNER: Okay. Yes, there are of course these paragraphs that amplify what is meant, and we could refer them to this page number.

All right, paragraph two was a paragraph where there was a lot of discussion over e-mail. Let me ask you whether you are satisfied with paragraph two.

Paragraph two, the issue was whether “fractions” was the very most important point, or whether it's the very most important point not presently developed. Bob?

ROBERT SIEGLER: I like the paragraph, in general. I'd like to suggest a small wording change that may address many of the e-mail expressed concerns, which, rather than saying “is,” which is probably overly strong, saying “appears to be,” which I think indicates that, to some degree, this is a matter of judgment.

CHAIR FAULKNER: Dan?

DANIEL BERCH: Actually, I have a concern about the first paragraph, mainly that, in the issue of assessment, we were talking about the difficulty, in terms of making sure that we don't over-emphasize or inadvertently emphasize the learning of fractions at the early elementary levels, but by now, combining elementary and middle school in that first paragraph, and information about learning whole numbers, fractions, particular aspects of geometry and measurement. I think we somehow lose that and the

problem is glossed over.

I realize we don't want to get too wordy, but we may want to make a separation there, to some extent, consistent with what we were talking about earlier.

WILFRIED SCHMID: The benchmarks actually do that. I mean, the benchmarks really, quite clearly spell out what comes where.

So, I think that if there is, for example, a page reference to the Benchmarks, then that should take care of your concern.

DANIEL BERCH: I think there is a lot of virtue in clear expression of these three elements, as the things to really concentrate on.

WILFRIED SCHMID: I think if you look at the benchmarks then you will understand that we're not advocating a wholesale teaching of fractions at grade three.

RUSSELL GERSTEN: I think that's why the “appears to be” suggestion was made. We need to be clear that there is no empirical basis. This isn't a logical mathematical analysis, but there is no empirical basis for this statement,

and given our charge was to start with the research and I know Dave's group scoured for it, but there is no basis for it. I would almost see that, being in here, in terms of content, not word-smithing that even though there is no empirical basis at the current point in time. We still believe, based on our analysis, just in fairness to the public, because, in other areas, like reading, there are empirical studies showing, if you don't know this by grade one or grade two, here are the problems.

So, I think in fairness to the public, I'd like to see that reference.

CHAIR FAULKNER: “Appears to be.” That's what you're saying, Russell.

RUSSELL GERSTEN: Yes.

CHAIR FAULKNER: Are you comfortable with “appears to be?”

ALL: Yes.

CHAIR FAULKNER: Yes?

BERT FRISTEDT: I think the second paragraph could be improved. I was listening to Dan's comment. If something was made about

operations with whole numbers, because you see it's elementary in middle school, but then the second paragraph is really middle school oriented.

So that would be my one comment, and just so I don't have to push the button again, on the third paragraph, I think somewhere we have to be a little more open to the other topics that are in the K-8 curriculum.

This treats them in sort of a dismissive way. So, that's my comment on the third paragraph.

CHAIR FAULKNER: Well, we're not to the third paragraph yet.

BERT FRISTEDT: Right. Okay, well, I made a comment on the second.

CHAIR FAULKNER: Okay. Well, you made a suggestion that something about operations needs to be there. But I need language. Do you want to propose specific language? Bob?

ROBERT SIEGLER: Yes, to get at Bert's concern, maybe we could have the most foundational skill not presently developed, and we could have an insert prior to entry into algebra courses,

because that's what the teacher's survey indicated. They were extremely concerned.

FRANCIS “SKIP” FENNELL: The teacher's survey indicates that and the NAEP results indicate that. While we don't have the kind of study that I think Russell referred to, we have a lot of descriptive data that would support that statement.

The only concern I have about the statement as it's currently worded is that it sort of swallows up the importance of whole numbers, and you could argue that you should pick that up and be understanding of that in the prior paragraph. And so, I just raise that as an issue.

CHAIR FAULKNER: Going, going. All right, I'm not hearing wording changes. Bob suggested this insertion, but I'm not so sure it actually strengthens it. Dan?

DANIEL BERCH: Well, even though, as Wilfried mentioned, you have the benchmarks laid out, why can't we still solve that by having one paragraph for elementary and the other for middle school, and talk about the emphases needed at each

level?

It's just, we're trying to find ways to make sure that we emphasize both, but somehow, do it within the paragraph that doesn't distinguish between those grade levels.

CHAIR FAULKNER: We can do that, but we're going to have to do that off-line, and you're going to have to work on coming up with the language.

DANIEL BERCH: I'll change that.

CHAIR FAULKNER: All right. Okay, well, I think if you all want to continue to work on dividing that, it's going to have to be done off-line. We can't do that around this table.

Let me ask about paragraph three. "These Critical Foundations are not meant to comprise a complete pre-school algebra -- to algebra curriculum, but do deserve primary attention and ample time." Any comments on that? Bert had some.

CAMILLA PERRSON BENBOW: Wilfried.

CHAIR FAULKNER: Wilfried?

WILFRIED SCHMID: I'm not sure I see

this as dismissive.

BERT FRISTEDT: This doesn't even name the things typically that people --

WILFRIED SCHMID: Yes, but the reason we don't name them is because the executive summary is not the place to lay out a curriculum. You have to look at the structure of the report and the executive summary.

I mean, what we're saying, in effect, is that certain things at the moment do not get the attention they should. So you single those out, and when you single them out, you of course also want to make the point that we are not suggesting that that's all that ought to be done.

So it seems to me that, right now, the phrasing does have the appropriate balance here.

FRANCIS “SKIP” FENNELL: Bert gave up?

CHAIR FAULKNER: Liping.

LIPING MA: I had a point about dealing with whole numbers, how -- support algebra learning. I think we missed one thing with whole numbers. Students can learn associative law and distributive law. That will support algebra

learning quite a lot, even before fractions. I don't know how we should view it or not.

CHAIR FAULKNER: Okay, let's go on to item five, the development of students in grade pre-K to 8, at an effective pace. The Panel recommends a set of benchmarks matched to the critical foundations, figure two, will insert page XX.

They should be used to guide curricula, mathematics instruction, textbook development and state assessments. Wilfried?

WILFRIED SCHMID: Well, again, I would like to say that this paragraph really ought to be enough to address your concern then.

I mean, we are really saying that somewhere, not in the executive summary directly, but somewhere, we are really laying this out.

So, I don't think any sensible reader will think that the recommendations in the executive summary really tell you where to put the dividing line between whole numbers and fractions. That is a further detail, and we are referring specifically to the Benchmarks where that actually

is done carefully.

So, I would really try to argue that as it is okay.

DANIEL BERCH: Agree with Wilfried.

CHAIR FAULKNER: Okay, go ahead, Tom.

TOM LOVELESS: I think Dan has a good point, actually, and it goes back to paragraph two. We talk about elementary and middle school, and we jump right to fractions, which are a middle school topic and whole numbers are just simply not mentioned.

I propose a single sentence, something along the lines of, "At the elementary level, proficiency with whole numbers is essential."

CHAIR FAULKNER: You're proposing this for item four?

TOM LOVELESS: No, this is back to two. It's that second paragraph that causes all the problems, because the introduction to the section talks about elementary and middle school. Then, paragraph two immediately leaps to fractions.

CHAIR FAULKNER: Which point are you under?

TOM LOVELESS: Point four, paragraph two, I'm sorry.

CHAIR FAULKNER: Okay, yes, all right. Now --

TOM LOVELESS: So, here's what I'm proposing. Leave the first paragraph as it is, but the second paragraph, the one that currently begins “the most important foundational skill,” should have a new introductory sentence that says, “At the elementary level, proficiency with whole numbers is essential.”

The second sentence then would begin, “For students beginning the study of algebra, the most important foundational skill not presently developed appears to be proficiency with fractions,” and we can cite the algebra teacher survey, we can cite the Learning Process report and we can cite a number of sources for that.

CHAIR FAULKNER: Is that --

WILFRIED SCHMID: Well, I think that, going back to the e-mail exchange that we had, I would be quite happy to have a sentence that also talks about whole numbers.

On the other hand, I'm not sure that we should really, in this point of the recommendation, get into the dividing line between elementary and middle school. Does elementary go up to grade six? It sometimes does.

So, I think that the phrasing should be functional. Integers have to be mentioned, and I'd be quite happy to have a sentence first that starts out with integers, and then proceeds to fractions. But at this point, don't bring in the question of division.

On the other hand, I think a point that is being made here is that, of course, if the sentence is added in, we have to be more careful. I think a point that this does make, and which deserves to be made, is that, while there may be lots of problems with how whole numbers are taught, there are bigger problems with how fractions are taught.

So if somehow the following thoughts come through, that whole numbers, of course, are a foundation for algebra, both directly and through their role as foundation for rational numbers,

then rational numbers are certainly a crucial entry point to algebra and that they are not presently well taught. That is what this paragraph should address.

CHAIR FAULKNER: I think we're going to have to go do this off-line then. Tom, what was your sentence?

TOM LOVELESS: "At the elementary level, proficiency with whole numbers is essential. For students beginning the study of algebra, the most important foundational skill not presently developed appears to be proficiency," and then it just continues.

CHAIR FAULKNER: Okay, all right. I'm inclined to accept that. All right, we've got to move on. You're not very happy with it?

ROBERT SIEGLER: No, I actually take Wilfred's point very seriously here and I think the problems with fractions versus whole numbers are of a different order of magnitude.

I imagine you'd have to look a long time for someone who didn't know when they started algebra, that 78 was larger than 45.

On the other hand, you don't have to look any distance at all, it will be the majority of entering students into an algebra course in most localities, that they won't know that three-quarters is bigger than an eighth, not on a systematic basis. They may get an individual problem right. Maybe they're comparing denominators and choosing the one with the bigger denominator as right.

But the level of understanding of fractions for a great many students is so poor that it really needs to be singled out as a special concern.

CHAIR FAULKNER: Dan?

DANIEL BERCH: I think I have a fairly simply solution. We're almost conflating two things. If we want to talk about what's necessary for entry to algebra, then we're focusing on that, rather than what you learned at what grade level, elementary or middle school.

As soon as we begin talking about elementary and middle school, it's leading to the suggestion that these are the things you need to

know at those levels, but then we don't want to get too deeply into the emphases on those things, or at least Wilfried doesn't think we need to.

So, I suggest either not saying anything about elementary or middle school, say and here's what you need to know to be prepared at entry and emphasize fractions or if we want to talk about whole numbers and whatever else, then we separate them in the way that we talked before.

CHAIR FAULKNER: Okay. Berch, you've gotten your point here and we'll have to see whether we end up with two points or not. We're going to have to do it off-line, I think. Doug, okay.

WILFRIED SCHMID: I think what Dan really says is that there is not particular reason to have the introduction with elementary school and middle school. As long as that is dropped, I don't think there is any problem at all. That's what you're saying and I agree.

CHAIR FAULKNER: Okay, yes, what he says is we either need two points or we need --

WILFRIED SCHMID: No, I think what he

is saying now is that we just dropped the reference to elementary and middle school. I mean, what we are really talking about is the pre-algebra curriculum.

CHAIR FAULKNER: So, you're not holding out for two points now?

WILFRIED SCHMID: No, I mean --

DANIEL BERCH: I'm just saying, it depends on whether the focus is on what you need at entry and --

WILFRIED SCHMID: Yes, I mean --

DANIEL BERCH: -- as opposed to what you need to learn --

WILFRIED SCHMID: I understand you to suggest that we are really talking about pre-algebra curriculum here, not elementary and middle school.

DANIEL BERCH: Just to try to avoid that.

WILFRIED SCHMID: Yes, and that, I think -- CHAIR FAULKNER: Okay, well, then we'll stick with what we have. All right, except for the “appears to be.” Let me go to item

six, please.

WILFRIED SCHMID: I think that Dan made a valid point and I think it resolves the issue. So, I think that Dan should make sure that the point is understood and then we incorporate it and then we can go on.

CHAIR FAULKNER: I'm totally confused.

WILFRIED SCHMID: What Dan is saying is that right now, it says the elementary and middle school curriculum should stress proficiency. What he is suggesting, as I understand it, is that instead of elementary and middle school curriculum, it should say pre-algebra curriculum.

CHAIR FAULKNER: Okay. Are you happy with that?

DANIEL BERCH: Pre-K through eight.

WILFRIED SCHMID: No, really pre-algebra. I mean, we may teach algebra in grade seven, for that matter. So, what we are really talking about here is pre-algebra.

CHAIR FAULKNER: Well, the problem with pre-algebra is that sometimes it is the name of a unit. How about the curriculum leading to algebra?

DANIEL BERCH: Right, in preparation for something, yes.

CHAIR FAULKNER: Okay. Now, I want to take us to item six, which is a debated point, Federal and state policies should give incentives to schools to offer an authentic algebra one course.

In Phoenix, we had quite a bit of discussion about this and the question is, where are you? Bert?

BERT FRISTEDT: I disagree with having that recommendation because if you push algebra into eighth grade in this fashion, it will tend to get watered down.

I think a better statement is, "Federal and state policies should give incentives for schools to offer what is typically offered in ninth grade," to make that available in the same form at grade eight and possibly even grade seven, and then for the students who do accelerate, to have something for them to take that's constructive in grade 12 and possibly 11.

CHAIR FAULKNER: Tom?

TOM LOVELESS: I've been against this every time it's been proposed. The only example, again, that I can think of, where this was actually done was the District of Columbia, that required all students in grade eight to take algebra courses, and then following NAEP, it was scored at the bottom of the nation.

So, just requiring a course is irrelevant. It has to do with what's actually taught. Our CKS group hesitated, in terms of recommending either an algebra course or an integrated course. It declined to endorse either one and yet here, we're endorsing an algebra course and our learning practices group hesitated to say that algebra should be taught at any given age and yet here, we're specifying the grade in which an algebra course is going to be. So, it just doesn't logically flow from what the other task groups have done.

There is the chance of unintended consequences from offering these incentives, schools offering algebra courses where they don't have a teacher who can teach it, for example, or

schools loading up these phony algebra courses. Districts and states do not have the ability to police the content of these courses.

So, I just think this recommendation goes in the wrong direction.

CHAIR FAULKNER: Wilfried, then Vern, you're here.

WILFRIED SCHMID: First Vern.

VERN WILLIAMS: I have problems with this also, for some of the reasons that Tom mentioned. If I were going to include this paragraph, I would change it to state, "Federal and state policy should give incentives to school systems to offer the content of an authentic algebra one course, period," not in grade eight.

CHAIR FAULKNER: Whether they're using an integrated curriculum or not?

VERN WILLIAMS: Right, because I think the problem is that school systems are offering algebra one courses that basically consist of fourth grade math, with a little bit of data analysis thrown in and if we can get them to offer authentic algebra courses, I don't care, it's

whenever the kids are ready.

Superintendents would love to state that we have 75 percent of our eighth graders taking algebra, and even though we may stress that it should be the algebra that we believe is actually algebra, that doesn't mean that that's what's going to happen in the real world.

CHAIR FAULKNER: Sandy?

SANDRA STOTSKY: I understand the concern about not having schools impose and then water down something called algebra in grade eight, which was why we tried to be extremely careful about this recommendation. It did flow from something that was in Schmidt et. al's study, in which he noted that across this country, and I forget the exact percentage, that many middle schools do not even provide for an Algebra I course in grade eight, so that students who are capable of taking Algebra I, can't even take it until they get to grade nine. This then means by grade 12, they cannot take an advanced mathematics course.

But the point here is to make sure

that it is an appropriate course and it's worded as the content of an authentic algebra one course, to make sure that it's not going to be watered down content.

Unless we have an incentive here to schools to think about this issue, what has been happening in the past decade or more has been the removal of algebra, true algebra, from grade eight and pushing it up to grade nine, in the name of having seven and eight and nine be heterogeneous groups of students and not allowing more advanced students by grade seven or eight, to take courses in algebra that they should have been able to take. I can speak of several school systems that have gone in that direction, as opposed to the bad example of Washington, D.C., which is an example of not allowing one bad case to make law. So, I would say that is a problem.

Now, the teacher issue that Tom raised, by the way, is an important issue, but we have teachers who are under-qualified at all grade levels, which doesn't mean that we stop offering math until we can get all these under-qualified

teachers up to par. That's a whole different set of issues.

I think this is very important for making sure that we have more kids and it's an equity issue, as well. More kids who are capable of taking an authentic course, should be able to do so, so that by grade 12, they can take the kind of courses that only some kids can take now.

CHAIR FAULKNER: Camilla, Wilfried, Tom. Well, Wilfried, Camilla, Tom.

WILFRIED SCHMID: Of course, I take these concerns that Vern and Tom articulated very seriously. However, algebra in eighth grade is certainly a movement that we are seeing, that exists. If we are silent, then we are silent about something that now plays a major role in the school curriculum.

So, I do believe that we cannot remain silent. We must say something and then, what should that message be? Perhaps Tom and Vern would be a little less worried if first of all, the order is reversed. That is, if we are talking about incentives, to prepare a larger number of

students for algebra by eighth grade and then to offer a course, and in addition to calling it authentic, we might also say that it should cover the material that we referred to earlier in our particular recommendation of what should be in such a course.

CHAIR FAULKNER: Skip? I'm sorry, no, you're not next. Tom is next, then Skip, then Wade.

TOM LOVELESS: I think it's redundant for us to be urging that the content be authentic. We've already defined what authentic content is, by the time the reader reaches this point.

The question -- this is a policy question and it has to do with what happens when incentives are offered, and there are unintended consequences that will flow from this. For example, if I work in a school where I currently have say, 10 seventh graders taking an algebra course, what I would wind up doing as a person doing scheduling is, I would want them to hold off on taking it until eighth grade, so that I could then qualify for these state incentives that are

being offered. So, I'd have a critical mass of students at eighth grade.

There are all kinds of things that can happen when you have states dictating the course offerings of schools. I think this is a naive recommendation. I do support Vern's alternative wording. We want Federal and state policies to give incentives to schools, to offer the content of an authentic algebra course. Whether students take it in grade seven or nine is fine, as long as they're prepared for it and that it's a good course.

CHAIR FAULKNER: All right, I think it's Skip and then Wade and then Wu.

FRANCIS "SKIP" FENNELL: In this country right now, 40 percent of the people who are in eighth grade are taking something called algebra or better. So, that train has left a long time ago.

What we have to say in this statement is that there are places where frankly, kids don't have access, and so, we tried to make that. That doesn't come in this recommendation as clearly as

it should.

I think the other issue is that we are pushing, frankly, a lot of kids into such a course, be it integrated or titled Algebra I or what-have-you, without the kind of prerequisite background. So, somehow this recommendation needs to deal with the prerequisites first, then access for those who have not had access currently, and I think the word “incentive” is loaded because of some of the points that Tom made.

I think the point here, as reconfigured, is a good one. All kids ought to have access, if they're ready, and we have to just fix the language to do that.

CHAIR FAULKNER: I started with the view that this point doesn't have the import that the other things that we're trying to convey in this section and that it probably shouldn't be in the executive summary, even if it is in the body of the report.

However, what I'm also hearing is a fair number of people who think something ought to be said because of the train that has left the

station, as Skip put it.

What I'm going to suggest is that we move on and then see if Skip and Tom and Vern can converge on anything that we would actually adopt. Is that okay?

FRANCIS “SKIP” FENNELL: Only if I get to say the following thing, I am, of course, President, Vern, of the National Council of Teachers of Mathematics. I want that recorded somewhere.

CHAIR FAULKNER: Only for a little while longer.

WILFRIED SCHMID: I think there should be double, triple terms for that office.

FRANCIS “SKIP” FENNELL: No, thank you.

CHAIR FAULKNER: All right. So, we're going to try to see if this can be re-worked covering the points that Skip mentioned and that various people have mentioned. I'll register my view that this business about incentives is dangerous and can drive behavior that we aren't actually looking for.

I think we ought to concentrate on

what we think the outcome should be, not on the mechanism for getting to the outcome.

Let me also indicate that there's coffee for the Panel, and we were going to have a break, but you've taken too long on content. So, if you want to go get another cup of coffee, go get one in the room that we're in and come back. But we're going to speed on here.

Learning Processes, Camilla, you left without making your point.

CAMILLA PERRSON BENBOW: Well, I did, but I don't know where to --

CHAIR FAULKNER: What we did is, we deputized Skip and Tom and Vern, to see if they can come up with something better.

CAMILLA PERRSON BENBOW: Yes, okay, because I think the main point is that I think a lot of students are ready for algebra earlier than ninth grade and if you hold them off until the ninth grade you don't provide a service by having to wait until the ninth grade. They can't get to calculus in high school and it limits their career choices.

So, I think for some students, but not all, there are lots of problems of implementation. For some students, they are ready for algebra in eighth grade or even in seventh grade and that option ought to be available in school districts that are large enough to support a high quality course that is true algebra. That is my only point. You guys go figure it out.

CHAIR FAULKNER: Good. Okay, we're going to Learning Processes. I'm sorry, we're going to the curricular content body and I think that first of all, we can assume that the results of the discussion that we have just had will get translated into the appropriate parts of the curricular content and what I'm going to do is run down this document in general terms. I've got to find the page first.

Okay, it's page 20. We're just going to go down the sections here. I'll ask you whether there are things that you feel like we need to address in these sections that we haven't already addressed.

If we've re-worded recommendations and

that sort of thing, we'll make them mirrored in this part. So, it's not necessary to re-discuss those items.

"Nature of school algebra," let me ask you about that section. Any comments on that section? Yes, Skip?

FRANCIS "SKIP" FENNELL: We have a statement. Most commonly, school algebra is organized in two courses, Algebra I and II. Less commonly, the content talks about integrated curriculum.

I don't know that commonly is the word there, and I hate to wordsmith, but there is this issue of an integrated opportunity to do mathematics and there are states, I believe five or six now, whose standards deal with integrated curriculum, and so, that's small, but growing.

WILFRIED SCHMID: But I think it's still accurate. It's a factual statement.

TOM LOVELESS: Well, we have factual data from the National Assessment of Educational Progress (NAEP), in terms of asking the teachers what courses they teach. They ask the students

what course they enrolled in, and the percentage in an integrated course at eighth grade. It's very small and it's been steady at say, two percent, I think, is the figure.

ROBERT SIEGLER: I think this is well justified.

CHAIR FAULKNER: Okay, “nature of school algebra?” Let me take you then to the Critical Foundations. We'll deal with the language and try to make it parallel.

WILFRIED SCHMID: Yes, I mean, the one thing that catches my eye is that “standard” is crossed out.

CHAIR FAULKNER: Well, yes, we have to address the question of standard algorithms.

WILFRIED SCHMID: Well, so, let's address them.

CHAIR FAULKNER: We can go ahead and do it.

WILFRIED SCHMID: All right. So, I think if we say “standard algorithms,” first of all, then it's clear what's meant. If we say “algorithms,” it's not clear what is meant.

Various reasons have been given for leaving out the word “standard.” The last one, as far as I know, was that internationally, there are no standard algorithms. This is just nonsense.

If you look at what is commonly called standard algorithm, for example, for addition, subtraction, multiplication and division, there is indeed, a standard algorithm that is taught in all the industrialized countries. The only difference is minor notational, for example, with the division algorithm, whether the divisor and the dividend are written horizontally or vertically. That makes absolutely no difference in the algorithm itself.

There are standard algorithms and that's what we would like to have taught. There also exists so-called student-invented algorithms, a variety of non-standard algorithms, which very often mean that intermediate steps are actually included in the notation and what we are asking is that the standard algorithms be taught.

What we are arguing against is student-invented algorithms, algorithms that are,

let's say, broken down with intermediate steps. There are standard algorithms. They ought to be taught and not the least reason is, that we'd like to have some commonality. We would like to have kids in Arizona learn the algorithm as we would like them to do in Massachusetts, and if we strike out the word standard, then indeed, there may be a message that we do not want to send, that anything goes.

CHAIR FAULKNER: Deborah?

DEBORAH BALL: Two points. On the point -- I don't think we need to get into a discussion now about transitional alternative or sometimes called student-invented algorithms, because that's not what this is about here.

We know there is discussion that can be had about those as teaching stages, as opposed to final products. We're not talking about how to teach here.

The second thing is, I would propose, if we're putting “standard” in, to take “the” out. In other words, “standard algorithms” without a definite article, because there are in fact

multiple conventional algorithms and I think the point we're making is to get to conventional algorithms and I would like to leave the definite article out. If not, then I'd like to discuss the array of quite conventional ones that all fall within the category that you're talking about. I think it's misleading to get into that debate. So, those are my two points.

CHAIR FAULKNER: Wu?

HUNG-HSI WU: I'm personally happy to leave the article out, but definitely, I want to support Wilfried's point that “standard” must be in. I think there's a misconception at the moment, that if you write something slightly differently, then you cannot call it a standard algorithm and that's a misconception and I think if nothing else, our Panel can set this straight.

When I teach teachers -- I mean, when I teach my students too, I ask them, "If I come in today wearing a blue shirt, tomorrow I wear a white shirt, do you say that you're two different persons teaching you?" It's the same person.

We don't make all those superfluous

attributes and therefore, the mathematics, it's always the same mathematics and therefore, we all -- in mathematics, we refer to them as standard algorithms and that is it.

So, definitely, I would strongly support having the standard in.

FRANCIS “SKIP” FENNELL: I agree with both Wu and Deborah, to delete “the” and add “standard.” I think that what we're talking about here are end points and to get to that end point, whether it's a partial sums method or a partial product that leads kids to that final end point, goes instructionally as well, and support Deborah's review of those techniques.

CHAIR FAULKNER: All right. Well, we have a proposal on the table, and that's to keep “standard” and to delete the article. We're okay on that? Okay, that's it. Go ahead.

VERN WILLIAMS: How many standard algorithms for addition are there?

DEBORAH BALL: In addition, one. How many in multiplication?

VERN WILLIAMS: But there's one, right?

How many? You tell me.

DEBORAH BALL: At least two.

VERN WILLIAMS: So, basically I agree with Wilfred. Do you consider student-invented algorithms standard? I consider, basically, the standard algorithms, of course, for addition, multiplication and division.

DEBORAH BALL: What makes one different from another?

VERN WILLIAMS: What do you mean, a different type of addition one?

DEBORAH BALL: So, if you say how many are there, and I say there are two, we'll say they're the same algorithm. As a teacher, I'll say they're not the same algorithm. So, I think we should avoid this conversation.

WILFRIED SCHMID: Well, I'm with them and I think that --

DEBORAH BALL: From our point of view --

WILFRIED SCHMID: -- you and I are co-authors of reaching for common ground --

DEBORAH BALL: Where we agreed on this

point.

WILFRIED SCHMID: We agreed and we --

DEBORAH BALL: So, let's not discuss --

WILFRIED SCHMID: No, we discussed it very carefully, that's true.

DEBORAH BALL: And there are different algorithms.

WILFRIED SCHMID: Well, I mean, I think that the sentence was different recording mechanisms do not constitute different algorithms.

DEBORAH BALL: If we want to, I'll get into showing you guys the different ones. I don't want to --

VERN WILLIAMS: Larry, what page are we on now?

CHAIR FAULKNER: Well, we're in several spots, but no, I mean, this question comes up several places, but yes, we're on page 23.

DEBORAH BALL: Twenty-three.

WILFRIED SCHMID: Well, so, Vern asked me if I'm happy with deleting the definite article.

I would not be distraught if the

definite article is left out, but I would much prefer it to be there.

CHAIR FAULKNER: It seems to me that it's a fair resolution to this, to just keep the word ‘standard’ and delete the article, so we can move on. Do I have support on that from this Panel?

DEBORAH BALL: Yes.

CHAIR FAULKNER: Raise your hand if you support the view that we should have “standard” with no article. That's to be it, and let me see if people want standard with no article, or they want standard with an article.

Okay, what's being proposed is standard with no article. Are you willing to accept that?

Raise your hand if you're willing to accept that. If you're opposed to that, then raise your hand.

WILFRIED SCHMID: Well, can we simply ask whether we would prefer the standard or standards? Why not put the question that way?

CHAIR FAULKNER: Well, there's another

position, and that is no standard. How many of you want standard in there, one way or another? How many of you want standard out?

Okay, well, standard is in. Now, the question is, how many of you want the article and how many of you do not? So, I'm going to suggest that we vote on that, who wants the article? And that is -- what is that total, eight, and how many of you do not want the article?

VALERIE REYNA: Skip is out.

CHAIR FAULKNER: You're abstaining. How many people are abstaining?

VALERIE REYNA: Skip is out.

WILFRIED SCHMID: The article stays.

VALERIE REYNA: But Skip is out right now.

HUNG-HSI WU: If you're not there, then your vote doesn't count.

CHAIR FAULKNER: Well, there's raft of abstentions. Okay.

VALERIE REYNA: Yes, we did vote unanimously that we wanted the word “standard.” So, the question is now --

CHAIR FAULKNER: Not unanimously.

VALERIE REYNA: Not unanimously. We voted strongly that we wanted the word “standard” in there. So, I think that's the feeling of the Panel.

CHAIR FAULKNER: That, I think, is agreed. The question of the article is not agreed. Okay, let's go on to -- we're continuing in the section called “Critical Foundations,” and there are paragraphs that indicate what we mean by fluency with whole numbers, fluency with fractions and particular aspects of geometry and measurement. Are you more or less happy with those?

Let's go to the Benchmarks. Benchmarks, you're happy with that?

DAVID GEARY: Yes, the benchmarks, as they are, sound fine. I just have one question about the first two, "Students should be proficient with addition, subtraction of whole numbers."

I'm wondering if we should state something about magnitude of those numbers.

WILFRIED SCHMID: If they should what?

DAVID GEARY: About the magnitude of the numbers. Of course, we know what we mean, but might it be interpreted as saying, "Being proficient with seven plus nine meets this particular benchmark," for grade three, or do we want it really to go beyond?

CHAIR FAULKNER: Do you want to say multi-digit? Yes?

DAVID GEARY: Including multi-digit.

CHAIR FAULKNER: All right, Skip?

FRANCIS “SKIP” FENNELL: Multi-digit is fine.

CHAIR FAULKNER: Multi-digit is okay, and that's in both of those first two points?

DAVID GEARY: Yes.

CHAIR FAULKNER: Okay, anything else in benchmarks? Yes?

SANDRA STOTSKY: Do we want to use the word “effective” in that second sentence or “optimal?” Effective sounds as if there is some measurement at the end, to judge effectiveness. In Benchmarks for the Critical Foundations -- this

is the introductory paragraph.

CHAIR FAULKNER: Effective base or optimal base?

SANDRA STOTSKY: There should be a word, I think, other than effective.

CHAIR FAULKNER: Well, optimal is as best as possible.

SANDRA STOTSKY: Yes.

CHAIR FAULKNER: Unacceptable is really what --

SANDRA STOTSKY: Or desirable or something.

CHAIR FAULKNER: Yes, I mean, you could go at a faster pace with the benchmarks.

WILFRIED SCHMID: I think effective is the right word.

SANDRA STOTSKY: You think effective? All right.

CHAIR FAULKNER: Okay, a need for coherence? Anything on a need for coherence? Yes?

A. WADE BOYKIN: I seem to faintly recall from a previous meeting, that the issue was

raised about the possibility that some low performing countries might also share some of these characteristics in the curricula as high performing countries. And so, I don't know if that got pursued, but if that's the case, it might lead to a different implication here, than what's here right now.

CHAIR FAULKNER: Low performing countries?

A. WADE BOYKIN: Might also share some of the curricular emphasis of the A+ countries, and if that's the case, then the comparison probably needs to be conditioned, rather than just saying we'll do what the high performing countries do, because maybe low performing countries do these also and then, that leaves for a different implication. I'd just thought that was going to be followed up and I don't know if it was or not.

CHAIR FAULKNER: Skip, do you want to comment on that?

FRANCIS “SKIP” FENNELL: Only that Wade, we did -- I remember exactly, the reference that Doug and Russ Whitehurst made at a prior

meeting and I know we considered that, and that's where I'd -- I'm done now.

CHAIR FAULKNER: What did you say, Valerie?

VALERIE REYNA: The question, I think is, did anyone check for sure about this, whether low performing countries shared some of these characteristics?

CHAIR FAULKNER: I'm sure they share some.

WILFRIED SCHMID: I'm sure that's true. I'm sure that's true. I mean, quite obviously, you just look at certain low performing countries and they do exactly what's being advocated.

On the other hand, the phrasing here in no way suggests that low performing countries could not share these characteristics. I think that you have a valid point, but I don't see that the phrasing here really has the implication that this is exclusively -- these are exclusively features of high performing countries.

A. WADE BOYKIN: I think my concern is that if we simply state, let's do what the high

performing countries do, not realizing that maybe low performing countries also do it, then we miss the possibility that it's how you do it, not that you do it, which is important.

CHAIR FAULKNER: Certainly, it is important, how you do it.

A. WADE BOYKIN: Yes.

ROBERT SIEGLER: Yes, we don't have to go to other countries to see the problem here that Wade is introducing. Within the United States, it just happens by coincidence that of the six states cited as implicitly praised for having the highest rankings, they include the states with the highest score on the current NAEP, which is Massachusetts, and the state that has the lowest score, which is New Mexico.

So, this illustrates a problem in saying that it's important for states to adopt these standards without qualifiers about the absolutely critical nature of the implementation of the standards.

CHAIR FAULKNER: Go ahead, Valerie.

VALERIE REYNA: So, perhaps we can add

a phrase that the implementation of the standards is critical and that comparisons across states must also take into account those that do not score high, as well as those that do score high.

CHAIR FAULKNER: We actually said that in the body of the report, in the large CKS report.

WILFRIED SCHMID: Well, maybe that's really where it belongs, I mean, in the CKS report, it is said. Again, I think that we have to distinguish what the crucial message is.

I think in the actual report, we do make this point. Here, I really don't think the phrasing in any way, suggests a direct association between doing certain things and doing well.

SANDRA STOTSKY: Right, I think we have the text. There's an actual sentence that talks about the fact that we do have high and low performing states among those six states and that you have to look at both state assessments, the quality of the state assessments and the implementation in the classroom curriculum as intervening variables, before you can get to

performance.

So, the qualifying statement is there. You can't just go from good standards to good results. There are things happening in the middle.

CHAIR FAULKNER: Well, but the fact that the Panel has brought it up suggests we ought to bring that stuff into this document.

SANDRA STOTSKY: Could lift it right out of the report.

CHAIR FAULKNER: Yes, we can take it right out of the report, okay. Integrated versus single subject approach. Dan?

DANIEL BERCH: Larry, I hate to go backwards, but there was a point I couldn't get in before, under the Benchmarks. At least, I can make it brief and they maybe, somebody can work out the wording. Is that all right to do?

CHAIR FAULKNER: Sure.

DANIEL BERCH: It was the last point. I'm sorry, under Geometry and Measurement, about similar triangles, I think it needs more specificity.

CHAIR FAULKNER: Are you talking about the text part of it?

DANIEL BERCH: The text -- Benchmarks.

CHAIR FAULKNER: You're talking about the actual table?

DANIEL BERCH: No, no, table three, the table, Geometry and Measurement, number three, yes.

CHAIR FAULKNER: Okay.

DANIEL BERCH: Notice, all of the other ones speak to the idea of becoming proficient and then spell out, even in Geometry and Measurement numbers one and two, what students should be able to do.

This says, "Should understand relationships involving similar triangles." So, I would argue that it needs a little more specificity, whether it goes to the point as extensively as CKS does, but it's still with respect to understanding about slopes and graphing and be able to understand those relationships.

CHAIR FAULKNER: Skip or Wilfred?

FRANCIS “SKIP” FENNELL: Good catch.

We'll fix it.

HUNG-HSI WU: How about master?

CHAIR FAULKNER: Well, that's more --

HUNG-HSI WU: Off-line, that's not a problem.

DANIEL BERCH: Okay.

CHAIR FAULKNER: Okay, we'll work that.

BERT FRISTEDT: It's going to be out of the Benchmarks?

CHAIR FAULKNER: Yes.

BERT FRISTEDT: I have comments on the recommendation.

CHAIR FAULKNER: Which one? You're down in “need for coherence?”

BERT FRISTEDT: Yes.

CHAIR FAULKNER: Okay, the one, "The recommendation that starts international studies?" Turn your mike on, please, Bert.

BERT FRISTEDT: Okay, thank you, Skip, for doing that. I would take out the mile-wide inch deep phrase. It has too much emotion connected with it, due to recent developments, recent, meaning last decade.

The other thing is, I'm wondering whether the distinction on number of key topics is as strong as put here. I somehow feel that in the U.S., often there aren't that many key topics, but they're fragmented and so, it's a slightly different tone.

But I'm certainly interested in taking out that mile-wide phrase.

CHAIR FAULKNER: Bert's proposing taking out mile-wide inch deep. What's the --

WILFRIED SCHMID: I think that that phrase has become almost a trademark and I think that certainly, Bill Schmidt has done a lot to convince many educators that this is a serious problem.

I think that for that reason, I would really prefer this phrase to remain, especially since it's in quotation marks. I think that it really serves a purpose to clarify what we're talking about there.

BERT FRISTEDT: I can agree, except when we were doing 2002 standards in Minnesota, I heard the phrase used in exactly the opposite way

for people on the opposite side of the issue.

CHAIR FAULKNER: Skip?

FRANCIS "SKIP" FENNELL: Same recommendation and it occurs numerous times and so, I'm just going to ask this. With an emphasis on mastery of key topics, this comes up a couple of different times in our report, and that is the use of the word mastery and I'm concerned about that because of the way that's interpreted in a variety of contexts.

In this sense, we're not talking about a Benjamin Bloom, eight out of ten correct mastery here. I would prefer the phrase "proficiency with key topics" and on and on, and actually, Dave, we've had this conversation, I think, and/or with Bob, relative to the use of mastery here. I actually wouldn't mind hearing what you're thinking about here.

CHAIR FAULKNER: You're being asked, Dave?

VALERIE REYNA: Yes.

DAVID GEARY: Apparently. It depends on how it's going to be interpreted by the people

who are reading this document. I have a sense of what mastery means, in terms of learning. The issues are one, how is this going to be interpreted? Is the term mastery, where you're saying it, it sounds like it has a different meaning than what we would mean if we were going to say mastery in a learning processes sense, which means automaticity, automatic use of standard algorithms and so forth.

So, I suppose we either need to explicitly define that or just use a different --

CHAIR FAULKNER: Valerie?

VALERIE REYNA: Yes, well, I think there is a distinction here between proficiency and mastery and I do think mastery has the added benefit that it does signal this issue of closure, whereas, proficiency doesn't quite get to that level. So, I would recommend mastery.

CHAIR FAULKNER: Russell?

RUSSELL GERSTEN: Yes, I agree with Skip. What mastery will be interpreted as by school districts is either 80 or in some cases, 90 percent on these weekly quizzes and sometimes,

kind of tedious, senseless review.

I see the problem with proficiency, but I'd rather go that way, unless we can find a third word then, mastery, because that is how schools will interpret it and how they are, again. I mean, I see that in reading. Mastery is now sometimes 95 to 100 percent.

Otherwise, you just keep going over the same stuff, the same way.

CHAIR FAULKNER: Wu?

HUNG-HSI WU: Is there some way to refer to the word proficiency in a sense of Adding It Up, because that, I think, is pretty much accepted by now in mathematics education? It's clearly defined and it's gaining acceptance pretty much, universally.

So, it should be easy to make a reference to say proficiency, in a sense of the document, Adding It Up. Then it would remove all ambiguity.

WILFRIED SCHMID: I mean, I think that the proficiency on the ground is understood to mean what we want to say here. So, I mean, while

there are some arguments to be made that -- in a technical sense, mastery is what you're asking for. I think that proficiency is going to be interpreted the way that we would like it to be interpreted, and saying any more than proficiency with parenthetical references to something else, is just unnecessary.

CHAIR FAULKNER: Okay. I've got two suggestions here. One is that we delete mile-wide inch deep. Let me see a show of hands on that. Who wants to keep mile-wide inch deep? Keep mile-wide inch deep, keep it? Who wants to not keep it? I saw the majority for keeping it. Now, the second is to substitute proficiency for mastery. Is there acceptance of doing that? Those who are willing to or in favor of accepting substituting proficiency for mastery, please show me your hand.

HUNG-HSI WU: With a footnote on there. Without a footnote, it might be --

CHAIR FAULKNER: Okay, all right. Substitution with a footnote. Yes?

DAVID GEARY: The footnote would say --

CHAIR FAULKNER: In the sense of Adding

It Up. Okay. I have to have some guidance here. Which one do you want to go with? Those who are willing to accept proficiency with the footnote, raise your hands. The other alternative is to keep mastery.

WILFRIED SCHMID: Why don't you first settle proficiency versus mastery and then the footnote?

CHAIR FAULKNER: Okay, we can do it that way. Proficiency versus mastery, who wants proficiency? That's five there and six there, that's 11 -- 12. Who wants mastery? That's a smaller number. Okay. Now, who wants the footnote? Footnote or definition of proficiency, referring to Adding It Up. All right, do you want a footnote defining proficiency or linking it to Adding It Up? Yes? No? There's indifferent.

All right, I've got to know. Okay, let's go.

TOM LOVELESS: Just one quick comment?

CHAIR FAULKNER: Yes.

TOM LOVELESS: NCLB is on the minds of all the states and they use the word “proficiency”

and each state gets to define it as they wish.

CHAIR FAULKNER: All right. The editor may choose a footnote. All right --

HUNG-HSI WU: That raised a good point. I mean, you may not want a footnote here, but you might want to add it to the CKS report itself.

CHAIR FAULKNER: Well, this is --

WILFRIED SCHMID: It's entirely different and I think in CKS, if you like a footnote, no problem.

CHAIR FAULKNER: Well, we'll work on it, okay. Integrated versus single subject approach, anybody unhappy with that?

Okay, that gets us to Learning Processes. We're going back up to Learning Processes, the things in the executive summary. So, going to page six, I think it is.

All right, item seven got quite a bit of attention in comments. So, let's go look at that. Deborah?

DEBORAH BALL: I'd like to propose that we accept some version, whether exactly like it or something close to it, of what Sandy proposed as

an alternative, where she combines point seven and eight into a positive statement about interventions.

I still have a question about the last sentence, which is one of the sentences about which there was debate. But I prefer her combination to what's presently there under seven and eight. So, I propose we adopt that and discuss.

CHAIR FAULKNER: Okay, Russell?

RUSSELL GERSTEN: I want to strongly second that. It has a can-do attitude and that is a kind of very bleak way to start Learning Processes. There is all kinds of confounds in the longitudinal studies with quality of teaching. So, I think that would be the way to go.

CHAIR FAULKNER: Okay, there is a suggestion that seven and eight be combined. There's even a motion and a second. Bob?

ROBERT SIEGLER: Before we go with that suggestion, I think one issue we have to think about is that there is truly minimal reference in our report as a whole to the special difficulties

that low income and ethnic minority and linguistic minority kids face in learning math, and often, schools are blamed for this problem.

It's important to acknowledge that while I don't doubt that some of it is the school's fault, it's not all their fault. I think teachers resent being blamed for problems that are really there because of the general structure of society, rather than because of anything the teachers have done. By explicitly acknowledging that kids from low income and ethnic and linguistic minority communities often start school behind, I think it recognizes the reality.

The fact is we wish it were different, but it isn't. This is a fact. It has long-term implications and by circumventing it and just saying, "Well, low income kids or at-risk kids should be given . . ." I think it steers attention away from a really crucial problem and I think we'd be remiss not to have some explicit recognition of that fact.

CHAIR FAULKNER: But that's a separate issue from the motion that's on the floor. We

could combine the two points and --

DOUGLAS CLEMENTS: It's not separate because Sandra took it out when she combined them. So, it's not separate. If the proposal is merely to combine them in a generic sense, it's different from adopting Sandra's text, as opposed to the text that's there.

CHAIR FAULKNER: Well, I think --

WILFRIED SCHMID: I think she made a generic proposal.

CHAIR FAULKNER: No, the sentence that Bob tried to propose for insertion there in seven was inserted after Sandy did her --

WILFRIED SCHMID: I think that both Sandy and Bob have valid points and what I would like to see is having the two points combined, number one, having the order, in effect, reversed to give it more hopeful spin and then, explicitly make the point that the general public understands quite well, it is a big factor in reading, and the general public probably understands far less well that it is a big factor in numeracy.

I think that ought to be said, but I

think it can be said while combining the two points and while reversing the order.

CHAIR FAULKNER: Okay, Deborah?

DEBORAH BALL: I think that this question about whether schools are blamed or teachers are blamed or kids are blamed is a very big problem for this Panel that can't be contained right here. This is one of the reasons why I would like to see us making a much stronger emphasis on teacher's education.

We have, if we want to in this country, the opportunity for a profession where people actually take responsibility for helping each child that shows up in school to learn.

What I like about Sandy's recommendation is we don't deal with that right now, about whose fault this is. We say something positive about what we know can help. We need, later in the report, to deal also with how we're going to equip professionals to have the capability to be responsible for student learning in this country, something we have not done.

I'd like to avoid this question. I

think students and their families have been blamed, at least, as much as schools have been and I'd like to get out of the blame question and try to talk more about what we know we can to. I'm responding to something Bob said.

So, Bob said something about teachers resent being blamed. I'm talking about what we can say in this report, about how we can equip people with the knowledge to do effective work with students and Sandy's proposals says something positive that we know we can do, which is effective interventions for young students, focused on mathematics. We often focus on other subjects and not on mathematics.

I repeat my proposal that we go with Sandy's proposal and not get into this question of pointing fingers at what the problem is, but rather, say something about what we can do.

CHAIR FAULKNER: Okay. Well, we're going to take up that question first. Deborah and Russell have proposed and others have supported, the idea of combining seven and eight, using Sandy's language as the basis of combining seven

and eight. Are you comfortable with that or do you want to speak to it?

ROBERT SIEGLER: In reference to Deb's concern, and Sandra's, I think it certainly would be fine to list eight before seven, if you think that would be a more positive lead-in.

I think some of the content, unfortunately, was lost in Sandra's. So, some of the things were deleted and you know, in going back to the original sections that support the detailed literature reviews that supported the particular points made here, those are obscured.

So, for example, it isn't that a variety of approaches was supported, it's that particular approaches were supported, that had effects for kids from low-income backgrounds.

Again, I want to underscore my concern and I know this is shared across members of the committee, that we don't deal enough with those issues in this report, the problems of income and disparities across race and ethnicities and so on, and this is an opportunity to do that.

Again, I do agree that the essence of

switching the order of them would create a very different impression. So, I can agree with that, but I don't want us to lose the content of seven and eight.

CHAIR FAULKNER: Tom?

TOM LOVELESS: I think it's important to have seven, because it is an empirical observation that kids come to school with these vast differences and it isn't assigning blame to students or to families, but it is a fact that schools have to deal with it. These differences are over a standard deviation between income groups.

So, they're vast and a lot of people have the impression that in math, they don't exist, that somehow math is taken care of and that everybody starts on equal footing. It's just not true.

CHAIR FAULKNER: Well, actually, of course, the content of seven is in Sandy's proposal.

ALL: No, it's not.

SANDRA STOTSKY: Let me get to

Valerie's concern about the opening sentence. I purposely worded it in this way to use a variety, because I didn't want to limit it to use one of the carefully developed and evaluated, because that would preclude others that might come along.

So, your concern that it should draw on those that have shown themselves is what I'm really trying to get at, without precluding anything new because you're asking for research on more possibilities. So, you've got to leave it open, that they could come up with better ones.

If there's a way to re-word that, to capture that, that was really all that was involved in that.

CHAIR FAULKNER: Doug and then Dan.

DOUGLAS CLEMENTS: Yes, I just think the phrasing “use a variety” almost recommends that they bring in five or six and just throw them in there, and so, it's just a wording problem.

I want to point out that although I see the logic of trying to come up with a positive spin first, the original ordering is just more chronological to me. Kids come to school with a

wide variety of math background. However, some kids have more than others. Therefore, interventions, especially for those kids, are very important to their future success.

To me, the logic of that just follows so much more nicely than the revision.

CHAIR FAULKNER: Dan, then Dave.

DANIEL BERCH: Doug made my point, not as well as I would have. Just kidding. He did it better than I would have. All I'll do is elaborate on that briefly, by saying the way Sandy has it. It starts out telling you that these intervention programs would help children who are at risk, without knowing anything more about them being at risk.

So, I support the notion that it's logical in the order it's currently in, seven and eight.

CHAIR FAULKNER: Dave?

DAVID GEARY: Yes, I agree with these points, and I don't see a problem with starting out bleak, because that's the situation. I mean, these are very big and substantial differences

that are maintained and in fact, increased, most likely, over the course of schooling.

It is a bad situation. That is something we can do something about. I don't think we want to gloss it over.

CHAIR FAULKNER: Doug?

DOUGLAS CLEMENTS: You may disagree with this though, and then that eliminates the suggestion, but I would start it out, most children come to school with a wide array of foundational skills or abilities. However, there's a big difference.

That starts it out positive and gives the impression that kids aren't a blank slate coming to even pre-K or K, or the like, starts it out positively, says that there's a gap and then you could move into the other.

CHAIR FAULKNER: Susan, then Deborah. Did you have your hand up, Tom?

SUSAN EMBRETSON: Yes, I think one of the problems with number seven is trying to pin-point the source of being at-risk and I think that is kind of objectionable. So, some of Doug's

content, I think, is good. Start it out that there is the wide array, but then there are students at-risk and why they are, who knows?

We maybe have more material in the body of the report. I think that makes seven more positive and it's something that we need to do something about, without blaming any particular party.

CHAIR FAULKNER: Deborah?

DEBORAH BALL: I don't have anything to add to what Susan just said. I agree with that and that was my argument as well.

CHAIR FAULKNER: Wade?

A. WADE BOYKIN: One of my concerns with number seven is that the third sentence, "These differences influence the math learning for many years thereafter," has a fatalistic tone to it.

If you come in handicapped, you're going to be handicapped forever. It does not implicate the fact that something can happen to intervene, to reverse whatever might have been a problematic beginning.

So, that's just one concern and therefore, I like the language, at least, in what Sandy wrote, which is sort of different, which says, "Mathematics knowledge that kids bring to school can influence their math learning." That takes away that little pejorative connotation, the fatalistic nature of that statement that's right there.

I think use of the term “at-risk child/children” is pejorative, it presumes the problem here is in children themselves, they're broken and have got to be fixed. I think that language needs to be altered. We can deal with that off-line.

CHAIR FAULKNER: Okay. Let me put the question to the group, the proposal has been made to combine seven and eight, in effect, possibly with the idea what we would edit it later or to keep seven and eight separate and I think we need to have a resolution to that question. So, can I ask -- yes?

WILFRIED SCHMID: I think that what has emerged in this discussion is that what Sandy

really wanted was some softening in the way it is read and I'm not sure Sandy is particularly concerned about having the two points combined.

So, it seems to me that what has emerged is that seven really has to be rephrased, maybe eight.

CHAIR FAULKNER: But we have a specific motion on the table, so we're going to have to get it addressed.

SANDRA STOTSKY: There should be a positive recommendation to the schools. That was my basic concern. Schools should be doing something, and then you weave in the other material in whatever way you way, but there's a message that goes, as a recommendation.

WILFRIED SCHMID: Yes, I think that there's actually pretty broad consensus. It is my sense that most of us really go along with the outcome of this discussion. I don't think we can vote on the specific phrasing, because there are too many varieties.

CHAIR FAULKNER: Deborah has got a motion on the table. So, unless she removes it,

we need to vote.

DEBORAH BALL: I'm not removing it.

CHAIR FAULKNER: She's not removing it.

WILFRIED SCHMID: What's the motion?

A. WADE BOYKIN: My second stays.

DEBORAH BALL: Can we accept the revision that Sandy proposed? I had said we should discuss the last sentence, which we haven't really, the one that you called fatalistic.

CHAIR FAULKNER: Well, I think if we can resolve the question of whether we're going to combine these or not combine these, we can talk about.

DEBORAH BALL: Exactly.

ROBERT SIEGLER: Yes, I'd like to support Wilfred's take on this. I think that we probably need to change the language, but without proving or at least, asserting that there is a problem here. The recommendation to do things differently comes out of nowhere and as Tom said earlier, most people probably don't understand that kids know much of anything about math when they come in, and if that were the case, there

wouldn't be any particularly compelling reason to have pre-school education programs.

But the fact is kids in general know a fair amount about math. Low-income kids and other at-risk groups, for want of a better word, are especially far behind the majority and they statistically have long-term consequences. And then without that basis and logic, the recommendation to just have pre-school programs comes out of nowhere.

CHAIR FAULKNER: We're going to need to break here. So, I'd like to get this vote taken. Is there anything that absolutely has to be said? Dan?

DANIEL BERCH: I think the key thing to Wilfred's alternative, to know if you're voting against Deborah's motion, is what are you voting for? I'd like to argue in support of what Bob said, as well.

First, that we remember the heading of this section is not recommendations. It's main findings and recommendations. So, we're suggesting you need to state something about the finding and

then the issue becomes, can we soften that in a way. I give an example on Wade's point, without appropriate intervention, these differences may persist or something.

So, I think people might be more willing to accept the alternative or retaining the order, if the idea of softening these things would lead more appropriately into the recommendations, can be done, and I think it can.

CHAIR FAULKNER: Well, there has been a lot of discussion about that. So, I'm presuming that people, when they decide which way they're going to vote on Deborah's motion, are going to take into account, the potential for editing seven. Deborah?

DEBORAH BALL: It's not so much just that it's a recommendation. Actually, it is a finding. So, the finding is as follows: kids enter school, as Doug said, with a wide variety of background, skills and knowledge and we know that there are students who come with less than others. We know that schools can actually make a difference in that, and here is what we're

reporting. Interventions and good teaching actually make an enormous difference, and that's what I think is the finding here. That's why I think it's important to include this.

CHAIR FAULKNER: Yes, we do have a hard obligation at lunch. So, I need to get us to a vote before lunch. Skip, you've got your microphone on. Does that mean something?

FRANCIS “SKIP” FENNELL: I was going to ask you to define hard obligation, but I'll take --

WILFRIED SCHMID: Well, then I would just like to say that I will vote against the motion to combine the two points, but do it full well with the wish that there be extensive rephrasing, and I hope that everybody else takes it similarly.

CHAIR FAULKNER: All right, let's vote on Deborah's motion. Deborah's motion is essentially to substitute Sandy's language as the starting point for seven and eight and then, we would deal with whatever editing we were going to do after that.

Otherwise, you would be voting to leave seven and eight and then to edit them after the fact. Okay. So, that's the question. All those in favor of making the substitution of accepting Deborah's motion, please signify by raising your hands.

Those who want to keep seven and eight as the basis for editing, please raise your hands. It's overwhelming. Then there's at least one who said he didn't care.

Okay. So, with that, I think we will stop at this point. We'll come back and we can talk about how we might want to edit seven and eight a little bit, but I think we're going to have to go off-line on seven and eight to get them clarified.

(Whereupon, the foregoing matter recessed at approximately 11:40 a.m.)

CHAIR FAULKNER: Let me welcome everyone back from the lunch break. Do we have our signer? Why don't you sign for a minute here, while I ask?

Okay. Well, let me welcome everyone

back from the lunch break. We have signing services available and they are in progress right now. If signing services are needed, we will continue them. If not, we will discontinue them with the proviso of being able to re-continue them on demand.

So, let me ask if anyone is using the signing services?

(No verbal response)

CHAIR FAULKNER: If not, then we will discontinue and proceed to the next portion of this program. It's a tremendous honor for us here at the Panel and us here in the audience to have Secretary Margaret Spellings at this tenth meeting of the National Math Panel.

Secretary Spellings is the first mother with school-aged children to serve as Secretary of Education. She herself is a product of public schools, I might add, from Houston, Texas.

Secretary Spellings is working to ensure that every young American has the knowledge and skills to compete and succeed in the 21st

century.

As a leader in educational reform at the state and national level, she believes in setting high expectations for all students and places a high priority on shrinking the achievement gap. She understands the essential role of teachers and supports strengthening the profession.

It was her vision that lead to the establishment of the National Math Panel with its charge to review the best available scientific evidence and to make recommendations on improving mathematics learning. Today, she's working also with colleges and universities to make higher education more accessible, affordable and accountable.

Ladies and gentlemen, I'd like to introduce a long time colleague and friend, Secretary Margaret Spellings.

SECRETARY SPELLINGS: Thank you, Larry. Thank you very much and I thank you again, Panel, for allowing me to come and visit with you this afternoon. But thanks even more for the

tremendous service that you all have done for students in this country and will do doubly so when you finish the thing and get it to me/the President by February 2008.

I know it's been a very challenging assignment and frankly, I think a little bit over due, that we would have some more understanding or more definitive words for our teachers and the educators that we owe this information, to give them our best thinking, as we have done in other curricular areas and the difficulty of the task, I think, has made it all the more worthwhile and all the more useful.

So, I can tell you that the folks in the field -- and I had the chance to talk with Vern, our teacher friend, at lunch, -- anxiously await, are starving for, very hungry for your work. I think it is a very, very important piece of scholarship and good practice and I'm very, very grateful. I know you all did it with some tremendous sacrifice and you all still have full-time jobs, lots of work to do, in addition to your volunteer assignments, but we really all owe you a

debt and the school children owe you a debt.

I would be remiss if I did not acknowledge the staff and contractors who supported your work, Tyrrell Flawn and the other staff, all of the contractors, and I would be even more remiss if I didn't recognize, once again, and certainly here publicly, my friend and colleague and fellow Texan, Larry Faulkner. He's an adopted Texan, really more, but he got there as soon as he could, as we say in Texas, and his steady hand, his keen intellect, his public policy experience has been just hugely valuable to your efforts. I know you would agree with me, as we commend and thank him as well.

So, I have a few thoughts. You all represent lots of expertise and lots of different points of view, lots of scholarship niches and so forth. Together, I think you constitute what is in my humble and modest estimation, sort of the most elevated level of Federal leadership under the Department of Education.

We look to provide guidance, to provide the best scholarship, the best research

and I am very grateful that you all have been a part of that because your experience has really added to the weightiness of this work.

We obviously visit schools all the time all around the country. As many of you do, I see this starvation; this hunger for what is our best thinking about math instruction. We all know, our teachers and school people, school administrators, are people of good will who want to do right, who want to close the achievement gap and sometimes, I call it the ‘tell us what to do and we'll do it’ phenomenon. I think we owe them that.

We don't expect our medical professionals to go into operating rooms without the best scholarship and the best research. Certainly, we should not expect any lower standard for those who work with our children every day.

I am struck by, as I read the materials to date, of your work, how much we actually do know around high standards of research and evaluation, that really is not, in my opinion, very well understood in the field. I think to have

it captured in one place with the understanding of what we do and maybe don't know about good practice will be very useful.

I think your observations about additional research and understanding is also over due. I pledge to you my support for those efforts as well. I think you all have recognized that your work probably is a start. There certainly are more unanswered questions that we need to continue to work through.

This is a critical time in our country for education. We all know, and we all have given this in our speeches, this incredible need for us to continue to be the world's innovator and leader and competitor. We know that that will be done only if we prepare our kids with skills particularly in mathematics and that this is an essential time to be having this discussion.

We are on the right track, I believe, with this focus on accountability for every child, a high quality education and because of No Child Left Behind, we're starting to see some real and meaningful progress, especially in mathematics and

it's not an accident. It's because people are focusing on it. They're working that problem more intently and more intensively than they have ever in the 25 or so years that I've been paying attention to it. I think the demand is there.

I'm very grateful to my friends from the National Institute of Child Health and Human development (NICHD) and the National Science Foundation (NSF) and the other participating agencies. We need to have our government cross-pollinate and work better, as we relate to programmatic funding.

I Chaired the Academic Competitiveness Council that the Congress asked me to do about a year ago. We discovered that though we spend about $3 billion a year on math and science education and soon will spend more with the passage of the American Competitiveness Initiative. God-willing, the funds will be flowing to that program for additional emphasis on the math pipeline, additional emphasis on advanced placement, and additional emphasis on teachers. Anyway, we spend lots of money and we're going to

spend more. We did not really have a very coordinated understanding in our government about what we wanted, what we expected and whether we had any evidence to support exactly what we were doing in the government. I think your work will be doubly useful in that regard, so that we can invest wisely and well on behalf of students.

I would be remiss if I did not mention the incredible care you have taken, with respect to the high quality of research, with the standards of research, the standards of evidence, because we all see in every product we see, in every teacher we talk to, the research based approach has become sort of the buzz word of choice. That really does mean something, and it certainly means something to a group of researchers and it's not any old thing. The care that you have taken to establish that and to honor that, I think also adds great value to your work.

Let me say in closing that the next chapter, when you complete your assignment for the Secretary of Education by February of next year, that we will all be on a mission to communicate to

tell the story and to raise the level of awareness with the people who are with our kids every day. I plan to be, hope to be and count on being, your greatest champion, as you bring clarity to some of these vexing issues. Though your terms officially end in April, I'm sure you have noted that you'll continue to be warriors and spokespeople for improved math achievement in our country. Again, thank you for your great work and all the best. Keep on. I'll get out of your way, so you can get back to work.

CHAIR FAULKNER: Thank you, Madame Secretary. We're honored by your presence. Okay, we're back and let me just indicate to the Panel and to the audience, that in order to make progress on the major points, what we're going to do is to not go down to the body of the report. We're just going to stay in the executive summary on the main points.

We'll continue here in Learning Processes for a little while, but I am going to put a time limit on how long we're going to stay in Learning Processes. By 2 o'clock we're going

to need to move onto something else. And so, let me go ahead now.

We had seven and eight. We had decided right before the break to leave them separate, but to modify the language. I think we're going to have to go off-line on getting that language modified and so, I'd like to see if we could get maybe Doug and Bob and Deborah and Susan to put together something. Wade? Okay, good.

Okay, if you want a six-person team, that's fine. All right. Let's see if we can't get that done.

Let's go onto item nine, which is computational facility with whole number operations, depending on sufficient practice and so on. Skip?

FRANCIS “SKIP” FENNELL: I notice in number nine that the word “standard” has been deleted and it therefore, gives me an opportunity to ask the question, whether or not the word ‘standard’ should be inserted back and the phrase would then read “the standard algorithms.”

Having not been here for the vote,

relative to that phrase, I question the use of the word “the” proceeding “standard.” I'm quite happy with having “standard” inserted back. If you want to re-vote, that would be fine or Wilfried is going to disagree with me anyway, and that's fine too. But that's my question.

CHAIR FAULKNER: Wilfried?

WILFRIED SCHMID: Well, I think this question has been settled. We certainly need to be consistent and it is very unfortunate that you were out of the room. However, no matter how you would have voted, the outcome would have been the same.

FRANCIS “SKIP” FENNELL: I'm not convinced of that. Deborah, didn't you have some points on this? I mean, I thought we were close to going the other way, prior to my departure.

WILFRIED SCHMID: No.

DEBORAH BALL: We didn't go that way, Skip. I abstained. So, I can speak.

FRANCIS “SKIP” FENNELL: I'm voicing my minority report, then.

CHAIR FAULKNER: All right.

DOUGLAS CLEMENTS: I'm sorry, Larry. I would like to say -- I was against the “the,” and I would like to say that if we're going to keep the “the,” we should at least be talking about what we mean by the standard algorithm, because there's a big difference if you take it that the standard algorithm is an exact procedural mechanism of an inscription, in which a one must be placed right here, or a two. Whether you take it as a broader abstract kind of thing, and maybe in the report, that just can be clarified and it would take a lot of the tension out of this discussion.

CHAIR FAULKNER: Wilfried?

WILFRIED SCHMID: Well, Deborah and I actually wrestled with the issue of standard algorithms and there is this document, "Reaching for Common Ground in K through 12 Mathematics Education."

I think that it would be appropriate to refer to that in the main body and I think that discussion then has to stand on its own. Deb and I disagree on the question of the definite article,

but we agree very much on what we wrote there and if that is then given as a reference, not to the executive summary, but later, then it seems that would address the concern.

CHAIR FAULKNER: We'll work on this.

FRANCIS “SKIP” FENNELL: That's fine.

CHAIR FAULKNER: Okay, I'm not hearing people disputing anything, other than “the.” Okay, let's move on to ten, as with whole numbers, fractional concepts. Yes, Wilfried?

WILFRIED SCHMID: Fractional concepts, I mean, even though this might almost be called an issue, but that is very unfortunate. I think what we are really talking about is conceptual understanding of fractions and it should be said that way.

CHAIR FAULKNER: Conceptual understanding of fractions? Is that what you mean?

DEBORAH BALL: So, you're saying as opposed to learning fractional concepts, it's conceptual understanding of fractions?

CHAIR FAULKNER: Yes.

DEBORAH BALL: Just being clear.

CHAIR FAULKNER: Learning conceptual understanding of fractions or conceptual understanding of fractions?

ROBERT SIEGLER: I think we want to keep in the idea of learning here and I think grammatically, we can do it well by incorporating Wilfried's comment in the following ways, as with whole numbers, acquiring conceptual understanding of fractions and operational procedures for fractions and decimals re-enforce one another.

CHAIR FAULKNER: Can acquire -- wait, acquiring conceptual understanding and what about operational procedures?

ROBERT SIEGLER: Acquiring conceptual understanding of fractions, including decimals and percentages and operational procedures --

CHAIR FAULKNER: Leaving out the learning?

ROBERT SIEGLER: Yes.

CHAIR FAULKNER: Okay.

SANDRA STOTSKY: Larry, could I just go back one, to re-wording it as a recommendation,

which would depend upon how Learning Processes sees this as capturing all the important things.

CHAIR FAULKNER: Going back one, meaning to nine?

SANDRA STOTSKY: Yes, to nine. I have that suggested re-wording, where it says, LRF-18, the comment.

CHAIR FAULKNER: Yes.

SANDRA STOTSKY: And that is re-wording it as a recommendation, if that captures everything that's there. It makes it look like a recommendation, as opposed to just a finding.

CHAIR FAULKNER: Sandy's proposing substitution. Dave?

DAVID GEARY: Well, I think the CKS group is making that recommendation, essentially and all we're stating is how to achieve that. I suppose it could be re-worded, but I'm wondering if we're getting into redundancy and that this is just a statement of how it would happen.

SANDRA STOTSKY: So, you're not concerned about putting these into the form of recommendations, necessarily, what is under

learning processes?

DAVID GEARY: Not here, no.

SANDRA STOTSKY: Not here.

CHAIR FAULKNER: I'm reading body language around the table that says leave it alone. Okay, then I'm going to be freer in my reading of body language. So, item ten, we've had that little language change there. Are we okay otherwise? Okay. Then we're going to item 11. My comment is that this a little bit duplicative of what's said earlier, and I'm not sure we need it, but I would like your reaction. Bert?

BERT FRISTEDT: I think this is the first place that the term rational number appears, rather than fraction, and I think we do want to use it in certain places. So, that's one comment.

Another comment is, somewhere I think the term mixed numbers should appear in all the work with fractions. Whether 11 should disappear, I don't have an opinion. But I think those two terms should be used somewhere.

CHAIR FAULKNER: Valerie?

VALERIE REYNA: Yes, we do mention

mixed numbers in the body of the report. The question is whether it should be in the executive summary and you can think about that while Skip is doing body language.

I would suggest on number 11, that we take the topic sentence, the difficulty with fractions as pervasive, put that in for 10, so that it leads into 10, then 10 talks about re-enforcing one another. I think that's a key point that comes up again and again and is well supported by evidence, namely that conceptual knowledge and procedural knowledge here and computation re-enforce one another.

But then I think it would be nice to mention that teachers feel that there's very poor preparation in this area. The point on time on task is extremely important and extremely practical, namely that academic performance in general, and in particular, on fractions, really is related to time on task, and we may want to pull that out. If we eliminate 11, we eliminate that point.

CHAIR FAULKNER: Okay, Wilfried?

WILFRIED SCHMID: Yes, I completely agree that I think no matter what is done, the sentiments that I expressed here need being expressed and I don't think there is real redundancy. So, that's number one.

Number two, in reply to Bert, rational numbers here appears as a quote, and as a quote, of course, it has to be rational numbers. But I think that elsewhere, we make the distinction of talking about fractions when we are talking about let's say, preparing for algebra and then, when we enter algebra, we talk about rational numbers. That division seems to make sense and it's in no way violated by the word rational numbers in this spot, since it's a quote.

I think that mixed numbers, I don't have any particular feeling, but I don't believe that it needs to be in the executive summary.

CHAIR FAULKNER: Okay, I'm hearing that you want to keep it. Tom, do you want to speak to that?

TOM LOVELESS: The last sentence in 11 is in 10.

CHAIR FAULKNER: Is in 10?

TOM LOVELESS: Yes.

CHAIR FAULKNER: So, you want to strike it from 11?

TOM LOVELESS: Yes.

CHAIR FAULKNER: Or strike it from 10?

VALERIE REYNA: Strike it from 11.

CHAIR FAULKNER: Okay, and then Valerie had a suggestion about the first sentence.

VALERIE REYNA: My suggestion was that the difficulty with fractions is pervasive. It would be a lead in to both 10 and 11, so I would just move that from 11 to 10, and that introduces the concept.

BERT FRISTEDT: Wouldn't you then just move the second sentence as well?

VALERIE REYNA: So, maybe we can solve this problem by exchanging 11 for 10?

BERT FRISTEDT: Or combining 11 and 10, and just cutting out the duplicate.

VALERIE REYNA: We can certainly combine them.

CHAIR FAULKNER: All right, time to go

to a team. Valerie, who is going to work with you on getting 10 and 11 re-done?

ROBERT SIEGLER: I actually think that we're very close to a solution on this one.

VALERIE REYNA: Yes.

ROBERT SIEGLER: And can avoid a team.

CHAIR FAULKNER: Okay.

ROBERT SIEGLER: What I'm hearing and what I agree --

CHAIR FAULKNER: Hurry up.

ROBERT SIEGLER: Okay, is that we start out with the first section in 11, and this becomes the lead in to 10, and we actually could continue --

CHAIR FAULKNER: The first section is the first two sentences?

ROBERT SIEGLER: Yes, that's right.

CHAIR FAULKNER: First two sentences?

ROBERT SIEGLER: First two sentences, and then we could go to the first sentence that's currently in 10 and then the order of the sentences that remain is somewhat arbitrary. We could either have the curriculum to allow for

sufficient time first, or instruction focusing on conceptual knowledge, is likely the broadest.

I would vote for curriculum going for sufficient time first, and then just finishing up what's left in 10.

CHAIR FAULKNER: Wait. So, we're going to bring a third sentence in 11 up there too?

ROBERT SIEGLER: Yes, it would be one item. It would start with the first two sentences in 11.

CHAIR FAULKNER: Right, then it goes to the first sentence of 10.

ROBERT SIEGLER: That's right.

CHAIR FAULKNER: And then it takes the last sentence of 11?

ROBERT SIEGLER: Yes.

CHAIR FAULKNER: Well, the last one that's still there.

ROBERT SIEGLER: That's right and then, the rest of 10.

CHAIR FAULKNER: All right. So --

ROBERT SIEGLER: Should I read it, the way that --

CHAIR FAULKNER: Not yet. I'll read it. What I've got here is, "Difficulty with fractions is pervasive and is a major obstacle to further process in mathematics, including algebra. A nationally representative sample of teachers of Algebra I who were surveyed for the Panel rated students as having very poor preparation in rational numbers and operations involving fractions and decimals."

"As with whole numbers, acquiring conceptual understanding of fractions, including decimals and percents, and operational procedures for fractions and decimals re-enforce one another. The curriculum should allow for sufficient time on task, to ensure acquisition of conceptual and procedural knowledge of fractions and of proportional reasoning."

"Instruction focusing on conceptual knowledge of fractions is likely to have the broadest and largest impact on problem solving performance, provided that it is aimed at an accurate solution of specific problems."

"A key mechanism linking conceptual

and procedural knowledge is the ability to represent fractions on a physical and ultimately mental number line." That's right?

Okay, there might be a place or two to eliminate so much of that conceptual and procedural knowledge of fractions, these topics, or something like that, and we can work on that.

Okay, all right. Let's now go to 11, call it 12, because that's what you're watching there. Somebody got a hand up? Bert?

BERT FRISTEDT: I would remove the word “simultaneously” because it's just a little too strong, to bring all of those together at the same time.

CHAIR FAULKNER: Hold on, okay. Bert votes for removing “simultaneously.” Tom, you're about to say something.

TOM LOVELESS: I don't think it means at the exact same moment, the way it's used, because the noun, in the sense, is the curriculum. And so, the curriculum extends over a year.

Simultaneously, I think, in this case, just means that all of them need to be occurring

roughly at the same time.

CHAIR FAULKNER: You can say, "Must, in parallel, develop."

WILFRIED SCHMID: Well, I mean, I completely agree with Tom, that I think if we left out the “simultaneously,” then there's not that much left. Yes, but still, I think I completely agree that “simultaneously,” as interpreted in a context like this, does not suggest doing it at the same moment. It just means that they are developed together. And so, I would say it should be left this way.

CHAIR FAULKNER: Okay, other comments? Okay, we'll move on. "Teachers and other educational leaders should consistently help students and parents to understand." This is the effort point. There's been quite a bit of discussion about this. Where do you want to go?

BERT FRISTEDT: I have a little question about the second paragraph. How do we know that? I believe it, but on what basis do we know that?

CHAIR FAULKNER: I addressed your point

on that, Bert, by saying it was self-evident. I want to point out that that goes back to the Declaration of Independence. Yes, go ahead.

DAVID GEARY: Evidence for this second paragraph of point 13 can be found in some of Harold Stevenson's work, comparing U.S. to East Asian countries.

CHAIR FAULKNER: Valerie?

VALERIE REYNA: And there really is excellent work with experimental studies, by Carol Dweck and others, showing that not only can these beliefs be changed about talent vis-à-vis effort, but that in fact, she has shown in her colleagues that this affects academic performance in mathematics.

CHAIR FAULKNER: All right. Wade?

A. WADE BOYKIN: I think that this is really a very elegantly stated point here in these two paragraphs together. In my opinion, it certainly truncates the research literature that was reviewed.

This is one of the very few places in this executive summary, at least, that the Panel

takes on the issue of the achievement gap. I certainly feel that should play a more prominent role in this report. But that's one person's opinion.

I think, at the very least here, there's other work that speaks to the enhancement of student's outcomes in math that this particular point 13 is silent on. I think it's very nice to see the point made that effort matters. But I think the data clearly shows that relationships matter in the process of learning. They're just showing that teacher effects are real and they have an impact upon achievement and when there are high expectations, it makes a difference and the data backs that up.

The data backs up that teacher/student relationships matter. Supportive yet demanding context in learning makes a difference, and again, the data in the body of the report backs that up. It also backs up the point that student relationships matter in learning.

CHAIR FAULKNER: Do you want to modify this or are you proposing --

A. WADE BOYKIN: Yes, I am. Certainly, we don't want to make this too long, but I do think a sentence or two that makes a point, that effort matters, as do relationships.

CHAIR FAULKNER: Okay, will you help with language on that?

A. WADE BOYKIN: I'd be glad to do that.

CHAIR FAULKNER: Okay, good.

ROBERT SIEGLER: Just in the interest of having each item about one main point, maybe it would make sense to have this additional literature, which is very important, that Wade alludes to, as a separate item.

CHAIR FAULKNER: Okay. Well, that's possible. Let's see how long it gets and so forth. If it does, then it would be better to focus on it separately.

Okay, all right. We're going to move on. Now, we're going into this grade one teacher and developer's instructional materials. This is the Piaget point, or the non-Piaget point, depending on how you want to address it or whether

you want to address it at all. So, there are items to discuss. Russell?

RUSSELL GERSTEN: I think the allusion to Piaget detracts from the message here. Many more people in the current teaching workforce know about developmentally appropriate practice, which NASA Institute for Advanced Concepts (NIAC), and others have been pushing for 20 years, then Piaget's theory. In fact, if anything, Vygotsky's theories are much more influential.

I would just drop that allusion. I don't see his theories being that influential. So, it seems unnecessary and it's irrelevant to many, I think.

CHAIR FAULKNER: So, what you would say it claims based on theories that children of particular ages. What's the reaction there? I'm seeing a sense. The larger question is, whether you want the point. There are several of you that do and several of you that don't.

FRANCIS “SKIP” FENNELL: Larry?

CHAIR FAULKNER: Yes, go ahead.

FRANCIS “SKIP” FENNELL: I like

Russell's suggestion. I have suggested at one point that this didn't rise to the level of import for the section. It was based solely on this over-reference to Piaget, where the point, I think, is more importantly developmental appropriateness. So, I support Russell's thought.

CHAIR FAULKNER: All right. Okay, I think we covered it. Now, we're going to teachers? Okay, I think we have a lot to talk about in this area. Let's take point 15, “teachers are critical to student's opportunities to learn and to their actual learning of mathematics” and so on. Liping, you look worried.

LIPING MA: Can I ask a question about Piaget again?

CHAIR FAULKNER: Yes.

LIPING MA: Do we ever mention Piaget, the other place in this report?

CHAIR FAULKNER: Yes.

LIPING MA: Yes, because according to my experience with teachers, they don't know much about Vygotsky, but many teachers are so familiar with Piaget and claim that Piaget developed it.

So, I think it is good if we make a clear statement about Piaget's theory.

CHAIR FAULKNER: You want to keep that in the body of the report?

HUNG-HSI WU: In the executive summary.

CHAIR FAULKNER: No, I'm saying, there are three different places that that point could be made. It could be made in the body of this report. It could be made in the executive summary. It can be made in the Task Group report. So, what's your comment on that?

FRANCIS “SKIP” FENNELL: I thought we agreed to revise what's there, to deal more directly with developmental appropriateness. Yet, in the body of the Learning Processes Task Group report is the full discussion, including the Piaget discussion. That's my sense of where we went.

CHAIR FAULKNER: So, what you're saying is that reference would be done in the body on this document, in this final report?

FRANCIS “SKIP” FENNELL: Yes, right.

CHAIR FAULKNER: But not in the

executive summary?

FRANCIS “SKIP” FENNELL: Correct.

CHAIR FAULKNER: Okay. Is that okay? All right.

DOUGLAS CLEMENTS: Just a quick note. I can't remember the body, even though I read it, but you guys don't claim that Piaget said these things, right? You just claim these are interpretations of Piaget, yes or no?

His theory implies stage-related stuff that's been questioned for sure, but he never claimed that there's an exact age. It was always an interaction between the kid and the environment and the like, and the same thing for developmentally appropriate practice.

I don't think you brought up that particular phrase from the National Association for the Education of Young Children (NAEYC), but they have been more mis-interpreted and mis-applied than they've done harm.

A. WADE BOYKIN: I might also add that Piaget himself said that he didn't think his theory of development really applied to education

practice anyway.

VALERIE REYNA: I think Piaget came down on probably all sides of this question.

CHAIR FAULKNER: Okay, we're back to teachers now. I'm not hearing anybody objecting to the idea that teachers are important. Okay, let's go to 16. This is Sandy's suggestion. Deborah?

DEBORAH BALL: I think we should delete this. I don't think this comes out of the report and the --

CHAIR FAULKNER: Turn your mike on.

DEBORAH BALL: I think we should delete point 16. It doesn't come out of the work of the task group and certainly, we shouldn't be referring to those three programs, since we have literally no evidence on those. So, I'm not sure where that came from. But I would propose deleting this item entirely.

CHAIR FAULKNER: Sandy?

SANDRA STOTSKY: I would urge that we consider having something positive about one of the three major issues facing the schools today in

math education, and that is the recruitment of knowledgeable teachers, knowledgeable people into teaching, and even though it isn't addressed directly in the task group report, it does relate to the evidence that teacher's knowledge of mathematics is related to student's achievement, which is why these three programs, as examples, all look to recruit knowledgeable people into teaching.

They all are aimed at making sure that those who are going to go into teaching have the knowledge to begin with. They are only examples. Whether the examples stay or not, is not my major issue. It was only to point out that here is where innovative programs are being developed. This is current. This makes us look up to date and we have nothing else on this major thrust, which is how we get enough secondary school teachers into our schools. There isn't any other place where it's really addressed.

CHAIR FAULKNER: Yes, Deborah?

DEBORAH BALL: I'd like to make sure that we do say something strong about teacher's

mathematical knowledge and I'd like it to draw on the research that we reviewed, which we'll get to in a moment in item 18. We can strengthen that considerably, based on the research we reviewed and I think we should do that there.

I agree that we should make sure that the report speaks to the importance of teachers' knowledge. I want to be careful that we don't re-enforce the mis-conceptions people have of the nature of that knowledge, because one thing our report did show, is that the typical ways people think of it have not been actually predictive of teacher's skills. The kind of mathematical knowledge, where we have seen that signal for K-8 teachers, is not the kind that has to do with having degrees or having a certain amount of course work.

So, I'd like to make sure we say this as accurately as we can. That is one of the places we did actually get good research and good findings. So, we do have things to say and I think we can strengthen our claim in 18, which will speak to Sandy's concern.

SANDRA STOTSKY: It really doesn't, because this is mainly about secondary school teachers of math and a good part of what is in the document is really about the problem of elementary school teachers, only it hasn't been identified clearly enough and we need to make those identifications much clearer.

For example, the knowledge level of secondary math teachers turns out to be related to the course work they've taken. This is not the case with elementary teachers. This is a different problem and those two levels, elementary and secondary, have not been separated sufficiently to make different types of statements about them.

But this issue, how we address the under-supply of knowledgeable teachers of mathematics at the secondary grade level is not addressed anywhere. These are the programs, as examples, of how that problem is right now, being addressed and I think we would look very out of date, or at least not up to date, if we didn't have something to say about this major investment

in energy, including one of the programs that a Panel member is actually considerably involved in, that is attempting to look at the shortage that is now facing all schools across this country.

Where are we going to get a knowledgeable math teacher? We have to show that we are thinking about this serious issue. It's just not mentioned.

RUSSELL GERSTEN: Larry, I'm hearing something disturbing, unless I'm missing something, which is that there is something that isn't in the report from this group, and we've had this very thorough research review, and it's just injected at the last minute into the executive summary and that just seems a procedure that is not acceptable to me, as a Panel member.

CHAIR FAULKNER: Tom?

TOM LOVELESS: That's it, Russell's point was the one I was going to start making. A reader of this cannot go to the task group report and find the body of evidence and I'm not even sure it exists, that justifies the naming of those three programs.

I am familiar with the evaluations of Teach for America, but I'm not familiar with mathematics necessarily being broken out on the Teach for America evaluations. They're very sparse in number to begin with and to name those three programs, I would expect to go to the task group report and then find some really good solid evaluation data that would show that they're effective.

CHAIR FAULKNER: All right, I think we need to resolve this question.

TOM LOVELESS: I move we delete the point.

DOUGLAS CLEMENTS: I second.

CHAIR FAULKNER: All right. Shall we go ahead and vote? Okay, those in favor of the motion, which is a deletion motion, those in favor of deleting, please signify by saying raising your hands.

Okay, those who wish to keep the point, please raise your hands. Well, we're voting. That's not a debate time. I think the vote was pretty clear-cut. So, let's see what you

want to say.

HUNG-HSI WU: Well, I thought the first sentence by itself stands as a recommendation. We can recommend it, so it doesn't depend on the finding, in the task group report, just the first sentence.

RUSSELL GERSTEN: Wu, it sounds like you're recommending these evaluated methods, but the evaluations aren't visible to the naked eye, the quality evaluations.

It says, "Schools must draw on a variety of carefully evaluated methods." But the research review didn't find them, so we're recommending, I don't know what.

HUNG-HSI WU: No, what I meant is schools must develop methods to attract and prepare mathematically knowledgeable teachers.

CHAIR FAULKNER: Isn't that in everything else we've got written there?

WILFRIED SCHMID: I think a slight variant of the language that was proposed by Sandy in the sidebar might be okay for this 16.

CHAIR FAULKNER: Pardon? What did you

say, Wilfried?

WILFRIED SCHMID: That 16 be replaced by the sidebar labeled LFR-31, that Stotsky suggests, and I think that maybe that has to re-phrased slightly.

CHAIR FAULKNER: Well, that was for 15.

WILFRIED SCHMID: Well, but the point that Sandy wants to make is that we have to address the need for getting knowledgeable teachers and that this might require alternate pathways.

I am not saying that we have to mention the word alternate pathway, but there has to be some understanding that at the moment, we are not producing enough teachers, that there is a need and one has to think about ways of satisfying that need.

CHAIR FAULKNER: Skip?

FRANCIS “SKIP” FENNELL: Wilfred, item 20, that begins, "The nation has a high need for better informed and better prepared teachers of mathematics," goes into the issues of teacher background, as well as preparation. If the need

here is to somehow account for alternatively certified teachers, it could be inserted within that statement.

WILFRIED SCHMID: Yes, that would be okay. Maybe that would satisfy Sandy.

CHAIR FAULKNER: I'd like to say that UTeach is not an alternative certification system.

SANDRA STOTSKY: Right.

CHAIR FAULKNER: It's a straight up teacher education system.

SANDRA STOTSKY: Could I also point out that 20 really focuses on getting research. It's a research focus and that is not what the schools need right now. It's talking about preparing teachers, but more rigorous research on learning is there. We need a well-designed program of research and so on and so on, for practice and certification.

It is not focused on how do we get knowledgeable people to come into teaching, to fill these vacancies right now. This is pie in the sky and this is why we're, in a sense, not being responsible in addressing what is an urgent need

right now.

CHAIR FAULKNER: Deborah?

DEBORAH BALL: I'd really like to propose that we keep going through the collection here, about teachers and teacher education. I'd like to suggest that we go through all the points about teachers that summarize for the executive summary and then when we stand back and see if there's something crucial we're missing. I actually feel confident that the key things we want to say are here, with some amendments.

CHAIR FAULKNER: I think that's a sensible suggestion. Let's go to 17. There's little generalizable research and so on. There has been a debate about whether this is significant enough, or at least informative enough to retain. What's your reaction?

(No verbal response)

CHAIR FAULKNER: No reaction. Bob?

ROBERT SIEGLER: We talked about gloomy before and this certainly is a prototypic gloomy statement, albeit accurate enough. I don't know if there's anything particularly that we gain by

including it.

It's implicit in both what we say and what we don't say, and there are certainly no policy recommendations of it. There's a research recommendation behind it, but that's made in other places.

CHAIR FAULKNER: So, you're moving to delete?

TOM LOVELESS: I would argue to keep it and I would argue to keep it because it serves a myth-busting role. There are people who think that the characteristics of an excellent teacher are known and actually, they're not.

We can identify good teachers, but usually after the fact. It’s difficult to generalize or to boil down those characteristics into say, a checklist. We have a lot of teachers who were evaluated and observed, where their supervisor brings in a checklist and they look for different behaviors. If they're not there, then they're judged to be an inadequate teacher. I think what this does is raises questions about that kind of procedure.

CHAIR FAULKNER: Deborah?

DEBORAH BALL: If other people want to keep it, then I think it would be best rephrased and added to point 15, because in effect, that's where we originally had it. We said it's interesting that we can identify teachers who consistently produce achievement gains in students, but unfortunately, we aren't able to identify the qualities and characteristics and skills of those teachers.

We could put it there and then I think we have the finding we originally produced.

CHAIR FAULKNER: Okay, could you give us that sentence again?

DEBORAH BALL: Do you want me to say it right now?

CHAIR FAULKNER: If you could.

DEBORAH BALL: I said something like, we are able to identify those teachers who consistently produce achievements gains in students. However, we're unable to identify -- you're going to have to fix this a little bit -- the qualities and skills of the teachers who

produce those achievement gains in students.

CHAIR FAULKNER: You talk pretty fast.

DEBORAH BALL: I'm not from Texas.

CHAIR FAULKNER: We are able to identify --

DEBORAH BALL: We are able to identify those teachers who consistently produce achievement gains in students and we can leave that thing about the compounding effect.

CHAIR FAULKNER: Okay.

DEBORAH BALL: However, we are unable to identify the characteristics and skills of those teachers.

CHAIR FAULKNER: Identify on the basis of research?

DEBORAH BALL: No, they don't. That's exactly what they don't do. The point we're making is that they don't tell us the qualities of those people. What did you say, ‘based on research?’ It's growing from the research that shows the --

CHAIR FAULKNER: Right, we're unable to identify the qualities --

DEBORAH BALL: I would say characteristics and skills, or something like that. But that's what it's coming from in our report. Our report reviews the value added research.

CHAIR FAULKNER: All right. We're going to have to fool with this.

DEBORAH BALL: And so, then we are unable to identify the qualities and skills of those teachers that lead to their capacity to produce those achievement gains. That's basically the point.

CHAIR FAULKNER: Well, actually, the sentence in 17 is very close to that.

DEBORAH BALL: Yes. So, I'm suggesting putting it together and not calling it a superior teacher. It's linked nicely if we put it together with 15, because that's how it came to us.

As Tom just said, we can work backwards, but we can't work forwards yet well, and that's a serious need, to be able to work forwards.

CHAIR FAULKNER: Okay, well, I think

the new idea that's in here is that we can identify those teachers who consistently produce achievement gains, but we cannot identify the qualities.

SANDRA STOTSKY: We need to qualify though that we need to identify them only from value added measures. There has been no other way of identifying them.

DEBORAH BALL: That's what we're saying. That's what this is going to be about. That's what it's based on. Why don't we add that later? It's in the task group report. We can get the wording.

CHAIR FAULKNER: Okay, I'll find a way.

DEBORAH BALL: The value added measures won't be something very understandable to the public. I think it can be found in the main report.

CHAIR FAULKNER: Yes, go ahead, Wu.

HUNG-HSI WU: I just want to point out that actually, this is very much related to the last sentence of number 20, which is about the inadequacy of the research in capturing the

essence of teaching.

CHAIR FAULKNER: Do you want --?

HUNG-HSI WU: So, I mean, this should be lumped together, the last sentence. Existing measures are inadequate. But doesn't that contribute to a teacher's ability to --

DEBORAH BALL: It's a different point, because this one has to do with the value added measures. We can only work backwards and we can't work forwards. A separate point is going to be what we learned about teacher knowledge and what we learned about measurement of teacher knowledge. Those both belong, but they're not the same point.

HUNG-HSI WU: It's not the same point. I thought they were --

DEBORAH BALL: The reason we can't identify the qualities isn't because of the problems of mathematical knowledge measurement though. It's other problems. It's not just mathematical knowledge. That's why it shouldn't be put together.

HUNG-HSI WU: Okay, one is measured,

the other is -- we don't know what it is, okay.

ROBERT SIEGLER: Yes, if we're going to keep something like the wording in 17, I think we need to make two substantive word changes.

One, substitute “rigorous” for “generalizable,” because “generalizable” calls to mind that there's good research about the qualities of excellent teachers in Brooklyn, but not in Kansas, and that isn't the case.

I mean, it's true, that that's true, but there isn't good research on the people in Brooklyn either.

Then the other one is substituting “identifying” for “defining,” because “identifying” is an empirical kind of term. “Defining” is a logical deductive one.

CHAIR FAULKNER: Yes, you want “identified.” Okay, all right. There is “defining” and “identifying” in this 17. It's going to take work. It's got to have work, but basically, the elements are as follows: teachers are crucial to student's opportunities to learn and to their actual learning. There's a

compounding effect if you have a series of good teachers. We can identify those teachers who consistently produce achievement gains, but there's little rigorous research identifying the qualities and skills that make up a superior teacher, okay. Those are basically the ideas.

DANIEL BERCH: Larry, just two seconds?

CHAIR FAULKNER: Go ahead.

DANIEL BERCH: Just a stylistic thing. I know you want to emphasis that. In 15, I just keep coming back to that. I think I would change that second part of that first sentence to, "The impact of teachers on students' achievement is compounded." It gets very confusing about the effects on effective and ineffective.

CHAIR FAULKNER: Okay.

VERN WILLIAMS: Just one comment on what Sandy said. The value added is important because many teachers are evaluated on measures, other than successful outcomes of their students learning.

CHAIR FAULKNER: Okay. Well, you'll see this one again and we'll have to get it worked

out. I'll work with Deborah and probably Tom, on trying to get this worked.

WILFRIED SCHMID: Also Sandy and Vern.

CHAIR FAULKNER: Yes. I'll work with the entire Panel. Number 18, the Panel takes this as self-evident. Here we are again, Bert, that no teacher can teach what he or she does not know, a quote from a colleague here. But anyway, this, I just re-did, after all of the back and forth on it and this is what I'm putting in front of you to shoot at. Bert?

BERT FRISTEDT: Two quick comments. Insertion of words, in the last phrase, where it says “knowledgeable,” I'd put in the “actual knowledge” and then “following knowledge,” rather than “courses completed.” We're in 18, right?

CHAIR FAULKNER: Yes.

BERT FRISTEDT: Last sentence? Some people are with me.

CHAIR FAULKNER: “Courses completed?”

BERT FRISTEDT: Right at the very end, the “actual knowledge,” rather than “courses completed.”

VALERIE REYNA: So, instead of the "knowledge commanded," it would be the "actual knowledge commanded?"

BERT FRISTEDT: Yes.

CHAIR FAULKNER: It's here, I see. It's the last sentence.

BERT FRISTEDT: Right.

CHAIR FAULKNER: Okay, in 18, "actual knowledge" --

VALERIE REYNA: Before the word "knowledge" there, he wants the word "actual."

CHAIR FAULKNER: "Commanded by teachers."

VALERIE REYNA: The "actual knowledge commanded."

CHAIR FAULKNER: Okay, Wade?

A. WADE BOYKIN: Maybe I'm reading this superficially, but it does seem that you overlap in the point made in 18 and the point made in 20. One refers to mathematics knowledge. The other refers to teacher knowledge.

If those are to be different, then they need to be maybe separated better in the

semantics of it.

DEBORAH BALL: Point 18, when it's finished, is going to be our best, strongest point about mathematical knowledge and its relationship to student's achievement and teacher's capacity.

Point 20 is going to be a point about teacher education. They're different, and Wade is right, that the way we've got them probably might cloud that. But 20 is not a repetition of what we found about teacher knowledge.

CHAIR FAULKNER: Okay.

DEBORAH BALL: This is the one that we were talking about earlier. In between, we have this other one, 19, which we have to deal with.

DOUGLAS CLEMENTS: I assumed we've replaced “define” with “identify” again?

DEBORAH BALL: In 18 or 20?

DOUGLAS CLEMENTS: Eighteen.

DEBORAH BALL: Yes.

CHAIR FAULKNER: To identify. Okay. Sounds like you're more or less happy with 18, with those wording changes.

ALL: No, no.

CHAIR FAULKNER: Okay.

WILFRIED SCHMID: Yes, with that said -- 18 can be strengthened, it should give us an idea -- CHAIR FAULKNER: Well, then how?

DEBORAH BALL: So, right now, it's a little like what Bob said earlier. We're saying a little too much about how little we know. But actually, on the question on elementary teachers, we weren't able to show relationships between courses or certification, but we were able to show some results for closely measured teacher knowledge of the kind Bert just said and student achievement.

So, it's a small word. I don't think it's at the level we should discuss right now. I just think we can strengthen it, which is what many people on the Panel have wanted, is to say we were able to show that teachers' knowledge of mathematics, the kind they need to do the work, there are signals that that's related to kids' achievement in the elementary levels. That's what everybody has wanted to say and it's in the

report, so we should use it.

CHAIR FAULKNER: So, you'll help me with this?

DEBORAH BALL: I'll help you with the wording.

CHAIR FAULKNER: Okay.

SANDRA STOTSKY: (without mike)

DEBORAH BALL: That's why we'll have to -- that's really what the report is about.

SANDRA STOTSKY: Secondary teachers do relate to courses taken.

DEBORAH BALL: Very, very likely, very few positive -- and this report is going to mostly be about K-8 teachers anyway, I believe. Well, that's what our report is about and that's what the task group report dealt with.

SANDRA STOTSKY: So, then none of this deals with that?

DEBORAH BALL: So, then Larry, we can get that, because that's basically what the task group dealt with.

CHAIR FAULKNER: Okay.

SANDRA STOTSKY: Can I ask that all of

this be worded as K-8 teachers then, if this is what we're talking about all the way through here, because this is teachers in general? We're making it extremely broad --

CHAIR FAULKNER: Microphone.

SANDRA STOTSKY: -- which do not carry over across all the K-12 grades.

CHAIR FAULKNER: Okay, we can do that.

SANDRA STOTSKY: Very important to start making distinctions.

CHAIR FAULKNER: Okay, Russell?

RUSSELL GERSTEN: Yes, one methodological issue and just a wording thing. I think we can, at the beginning, say we focus on K-8 teachers because our charge is getting kids ready for algebra, unless it's special education and an eleventh grade teacher.

CHAIR FAULKNER: Right.

RUSSELL GERSTEN: The other thing is, the way Mark Lipsey has guided our group is to not use words so much about small, moderate, and so on. If it's significant, it's significant, and so, that is something you might want to think in

re-crafting it, just a methodological issue.

CHAIR FAULKNER: Okay. Yes?

FRANCIS “SKIP” FENNELL: Just one point, Deborah, relative to the language in here. We talked about defining best hiring or development practices. Is that to read, "Best hiring or professional development practices." Is that about PD?

DEBORAH BALL: That didn't come from our task group report, so I've been waiting to see if anybody is going to comment on it. That came from somewhere else.

CHAIR FAULKNER: I told you, I re-crafted this whole thing, trying to figure out what to say.

FRANCIS “SKIP” FENNELL: Actually, a point of record, as I recall, you are not, in fact, a Texan.

CHAIR FAULKNER: What?

FRANCIS “SKIP” FENNELL: Point in fact, you are not, in fact, a Texan.

CHAIR FAULKNER: Well, that's --

FRANCIS “SKIP” FENNELL: But I think

if, in fact, we're talking about a professional, it needs to be inserted because I think the intent there is professional development.

DEBORAH BALL: It's a little bit out of place here, because to have a strong statement about what we know about teacher knowledge would be better --

FRANCIS “SKIP” FENNELL: Well, then we either --

DEBORAH BALL: -- and not mix it up with the higher --

FRANCIS “SKIP” FENNELL: -- need to strip that out or we define it.

DEBORAH BALL: And put it in later, in another spot, because it confuses a little bit of what we're saying right there, if we have in the middle. It's not that it's not an important point. It's just in the middle of the teacher knowledge finding. Having it in another point, I think, would be better.

ROBERT SIEGLER: I share this concern that Deborah, in particular, and Skip could agree -- express, that the talking about the development

and hiring. It wanders away from the main thrust of the point. The main thrust of the point goes back to the task group report, which is that measures of number of courses taken in math and certification status correlate minimally, if at all, with success in helping children learn math. That's the real gist of this point, as opposed to some of the later points.

DEBORAH BALL: But we did find measures that showed mathematical knowledge making a difference.

ROBERT SIEGLER: That's right, but that would be a later sentence.

CHAIR FAULKNER: But in the end, policy people want to know how to hire and develop teachers.

DEBORAH BALL: Yes.

ROBERT SIEGLER: Well, right, but I don't know that this item is the place to do it. Twenty is more specifically addressed to that and I think it is important for policy makers to understand more about measures like certification and number of courses taken. I think everyone here

expected those to have at least significant positive relations to teacher quality. You read in the newspapers all the time about how bad inner city schools are because many of the teachers aren't certified.

Well, they are very bad, but it's not clear that it's for that reason.

DEBORAH BALL: We need to be a little careful with this, because remember, this bears on the point that we're talking about elementary teachers. So, the certification results have to do with looking at math certification, which isn't very relevant to the elementary teacher question.

So, that's why we need to be, as Sandy said, careful about which teachers we're talking. So, the hiring practices around certification don't say that certification has no bearing on teacher's success. We're talking about certification in math, which doesn't actually show up for elementary.

We should be careful about what we're saying here.

CHAIR FAULKNER: Tom, then Sandy.

TOM LOVELESS: Deborah, this is a question. The use of the word “correlation,” is that to imply that we can't, in 18 --

DEBORAH BALL: Yes, go ahead.

TOM LOVELESS: Is that to imply that those proxies that are in the sentence before it, “certification status” and “courses taken”, that the studies themselves were designed in such a way that they just looked at correlations, maybe with controlling for some covariates?

DEBORAH BALL: No.

TOM LOVELESS: They really weren't designed in such a way that we could make any causal inferences?

DEBORAH BALL: No, we were looking for causal inferences, so I think that's probably technically not a correct sentence that we need to clean up and we'll look at the task group report and get it clarified. Most of what we were looking at for these we were controlling for.

TOM LOVELESS: Yes, I think the word correlation might then raise --

DEBORAH BALL: Might be misleading.

TOM LOVELESS: -- a red flag there.

CHAIR FAULKNER: Okay, Sandy?

SANDRA STOTSKY: I would like to raise a question about whether the final sentence is actually a logical conclusion to the point that's being made in the paragraph, in addition to having a distinction between second --

CHAIR FAULKNER: Mike on.

SANDRA STOTSKY: I did. I hadn't just moved it over, sorry. But the final sentence is not clear to me that that's a logical conclusion, to the point of the paragraph.

We agree that math teachers should know the subject they teach, and whether these studies show people how to hire and provide the best development possible for the teachers, we then go into this notion that, "Well, there's only a small positive correlation and therefore, we need measures."

Well, if it is the case for elementary teachers that the courses taken are not a good proxy, one could come to the logical conclusion that we need to look better at the courses they

had taken to find out what was wrong with the courses they took, that it didn't serve as a good proxy.

In other words, it's not that you need a new measure necessarily, but you need to take a careful look at the kind of courses they did take in K through whatever, sixth, seven and eight, to find out why they didn't serve as a good proxy or why certification did not serve as an accurate proxy.

That's, to me, the logical conclusion of saying, "Here, we've got these things that have been built in by the system for trying to assure that we have qualified teachers coming into the schools, and yet these things don't predict."

So, let's take a look at these entities that we put in to place by statute or other means, to find out why they don't work. This would lead to two totally different kinds of issues, not the development of the measure.

CHAIR FAULKNER: Deborah?

DEBORAH BALL: I think I can clarify that, partly because we're truncating and going

back from the task group report. In the task group report, we used, as you will recall, three different methods for trying to identify teacher knowledge.

The two that didn't predict student achievement were the proxy measures, but the place we were able to probe and get the closest relationship was where we were closer to the actual usable knowledge in practice. That's where we got the achievement gain results.

And so, what the task group report says is that we would be able to get better precision around what mathematics teachers really do need to know, if we were able to measure more closely. That's why it is related to what Wu raised earlier. If we were able to measure more closely, what it is that teachers know when those teachers actually produce achievement, then we would be in a better position to inform teacher education and to improve those courses.

That's why the measurement point is coming up here and maybe it's sort of that the logic got broken a little bit in the compression

and we should just get the logic clearer. It's those three different kinds of approaches to measuring teacher knowledge. The finding had to do with when we were actually able to get results and this is when the measures were the most closely related to the usable knowledge used in teaching.

CHAIR FAULKNER: The reason the logic looks that way is it's because my impression was that small positive correlation was with the traditional measures, certification status and --

DEBORAH BALL: Only for secondary teachers.

CHAIR FAULKNER: Okay. So, we need to work on this.

DEBORAH BALL: All right.

CHAIR FAULKNER: Let's go off-line on this.

DEBORAH BALL: Okay.

CHAIR FAULKNER: Adequate preparation of students for algebra requires their teachers establish strong math background. That's 19.

TOM LOVELESS: I was unclear as to what this proposal was targeting. Is it suggesting

that we assess whether pre-schools through grade three teachers know the pre-school through grade three critical foundations or how to teach them?

CHAIR FAULKNER: Sandy, you suggested the point. Do you want to make a --

SANDRA STOTSKY: This comes directly out of the CKS report. This is one of the recommendations in the CKS report, agreed upon by all the task members of the CKS report.

It related to the knowledge base that is the focus of the CKS report and one of the recommendations is that this knowledge base should not only be in text books or elsewhere. It should also be in teacher preparation programs if we expect prospective teachers to be able to address the critical foundations and then to be able to address the major topics of algebra.

That's where this fits in and this one of the recommendations would affect teacher training because it's the only one that addresses teacher training.

TOM LOVELESS: Again, does it have to do with teachers knowing that content or knowing

how to teach that content?

SANDRA STOTSKY: This is the content. It's if there is a relationship between teacher knowledge of math and student achievement, then we want to make sure that the math content they need to know is given to them in their preparation programs.

TOM LOVELESS: Okay, then I would say we have already made that point earlier, when we said that teachers must know the content they're going to teach. So, there's no need to re-iterate it here.

SANDRA STOTSKY: No, this deals with separate things. If you look, it's broken down into different levels because there's a different amount of content that you have to license your programs and these are true across the entire country. You have different levels of mathematics knowledge that you expect of the early childhood teacher.

You do not expect the major topics of school algebra to be taught to the pre-K through three teacher. This is true in every state. You

have these divisions of what mathematical knowledge should be taught and then taught by. So, that's where the three divisions come from.

CHAIR FAULKNER: All right Wu, then Deborah, then Skip, then Bert.

HUNG-HSI WU: So, the original intention was that in CKS, we wanted at least this much knowledge for every teacher because we ask every student to know this.

Now, that I think about this a little bit, I'm slightly worried that this would be misinterpreted. The way it stands is that if I can teach the teachers this much, then they know enough and I think that's very dangerous.

Should we say that they should know at least two years beyond what they teach? That's a suggestion that someone made, that they not only know that part of the knowledge, that we prescribe for the Critical Foundations, but you teach fifth grade, you should know things up to sixth and seventh grade, and also, third and fourth grades.

CHAIR FAULKNER: But we don't have any research that bears on that.

HUNG-HSI WU: No, it's just -- we have no research. That's just the case. I mean, the same way that --

FRANCIS “SKIP” FENNELL: This is a recommendation to take the mathematics that has been defined as leading to algebra and what algebra is, and using that as consideration for how we build in the background, content knowledge only, nothing related to instruction, could inform teacher education practice, that's it.

And so, as you think about it, many of the task groups, in their specific area, worked on other areas that might inform other task groups. In CKS we felt that this might inform the teacher of the teacher task force, solely based on that element of content. That's where it came from.

CHAIR FAULKNER: All right.

HUNG-HSI WU: Can I ask -- after what Skip said?

CHAIR FAULKNER: Sure.

HUNG-HSI WU: So, it is true, that to say you want teachers to know more, let's say, for the sake of argument, that you want teachers to

know two years beyond what they teach.

On the other hand, can you make a good argument for this, the same way? Yes, about saying you cannot teach what you don't know. For example, suppose somebody teaches fractions. We make it clear that for grade six, grade five we want students to know fractions. Therefore, teachers need to know fractions, because it's a critical link in the learning of algebra.

So, a teacher who only knows about fractions, but nothing about algebra, how is that teacher going to teach it well if he or she doesn't know that? This is what it's designed for.

So, I think you can make a very, very clear cut, very persuasive argument about why you would recommend something like this. And so, to that extent, I think that it's a perfectly valid statement from the Panel.

CHAIR FAULKNER: Okay, we've got Deborah and then Skip and then Bert, and then --

FRANCIS “SKIP” FENNELL: No, I'm done.

CHAIR FAULKNER: -- and then Camilla

and then Tom. And Vern.

DEBORAH BALL: I see the logic. At the same time, there's something a little peculiar about it, because what we were charged to do was to investigate what's known about what teachers actually have to know, that we can link to their instructional efficacy and student achievement, and this is coming out of a different part of our thinking.

So, it makes sense. I'd like to figure out a way to do this that doesn't seem to short-change the fact that the one area in which we actually found a lot of research was on the relationship with teacher knowledge and student achievement.

This is logical, that you're recommending this, but it doesn't really fit very well here.

FRANCIS “SKIP” FENNELL: It's one of the CKS recommendations. It doesn't necessarily have to even show up here.

DEBORAH BALL: Yes, I think it would be better to --

FRANCIS “SKIP” FENNELL: It would be better to put it in CKS.

DEBORAH BALL: I think that would make more sense.

FRANCIS “SKIP” FENNELL: It's logical --

DEBORAH BALL: It's logically implied by what you --

FRANCIS “SKIP” FENNELL: It's in the CKS report already. It doesn't need to go anywhere.

DEBORAH BALL: I think that's better.

FRANCIS “SKIP” FENNELL: So, it goes out of here. I'm happy to delete it.

CHAIR FAULKNER: All right, we'll put in CKS.

VERN WILLIAMS: Can I just make one comment? It's embarrassing. This is very, very embarrassing, to say that a teacher, who has had a K-12 education and four years of college and happens to be teaching fourth grade, should at least know sixth grade math.

TOM LOVELESS: The other problem is, I

don't know if those of you who have trained as teachers, I did, have heard of a pre-school through grade three certification or training program. I never have.

You usually train as an elementary and you get into elementary credentials. So, these are grades one through five.

SANDRA STOTSKY: Tom, I can show you every certification book in the country. Each state has a program for pre-K through three, early childhood, they call them. They were training kindergarten teachers 30 years ago. That's the program.

TOM LOVELESS: Most states grant licenses that are not pre-school through grade three or grades one through five.

FRANCIS “SKIP” FENNELL: Tom, early childhood certification is typically one through six, depending upon jurisdiction. There are 40 states that have something in the name of middle school, and those are very different across platforms. Secondary ranges from seven to 12 to nine through 12. That's pretty much the

landscape.

The major point here is, this should go out of this section. It lives already in the CKS report and we should move on to the next item.

CHAIR FAULKNER: Well, Bert and Camilla still have things to say.

CAMILLA PERRSON BENBOW: My comment is a more general comment, given that we settled this. I'm concerned that when you look at Teachers and say, Instructional Practices, we limit ourselves to a specific set of studies that follows certain evidence and standards, and there were lots of things that a lot of us felt very painful about that we couldn't say, because the studies weren't there to support those views.

It may be that the views are correct, but we couldn't find the studies to support them. As we continue through this report, we can't use different standards of evidence to put in new recommendations.

And so, if the Teachers task group had specific standards of evidence that they used to evaluate the findings, I think that the only

findings that we can include are things that meet those standards, otherwise, I'll go back and say, "Gee, let's throw this in and let's throw that in," and so, we get a mess.

And so, I feel that this bothers me greatly, these insertions of comments from other reports, where they had a different standard of evidence.

ROBERT SIEGLER: In the interest of time management --

CHAIR FAULKNER: Yes, we're going to have to move on.

ROBERT SIEGLER: Yes, I move that we delete this item for all the reasons that many people have already said.

CHAIR FAULKNER: All right, well, I think we're --

CAMILLA PERRSON BENBOW: But it's a general principle that I am talking about.

CHAIR FAULKNER: All right, let's --

HUNG-HSI WU: I have a question.

CHAIR FAULKNER: To 20, okay.

HUNG-HSI WU: Question, I want to know

what's the status of this? Does it get moved into CKS or does it --

CHAIR FAULKNER: It stays in the CKS body.

HUNG-HSI WU: But you move it there, not delete it, right?

CHAIR FAULKNER: It stays in the CKS body.

HUNG-HSI WU: It's there already? Not in what we are seeing. Where? Give me the number.

CHAIR FAULKNER: My understanding is, it goes to the CKS body.

HUNG-HSI WU: Body, yes, but not in the executive summary.

CHAIR FAULKNER: Right.

HUNG-HSI WU: Yes, but I thought it should belong in the executive summary.

CHAIR FAULKNER: Folks, we've got a lot more stuff to do. Let's move to 21 here, schools should be -- sorry, 20, yes.

All right, number 20, this is the well-designed program of research. Deborah?

DEBORAH BALL: Well, it's actually got two things here, because the first has to do with systematic improvement of teacher education. It's not about research.

Then this next point is an insertion from the, I guess, from Learning Processes, which I think, by the same basis, we just moved the CKS stuff out. We should move that out.

Then the final thing is research. So, there's three different things in this point, and I would suggest we keep only the first, because that's what comes from our report.

CHAIR FAULKNER: It stops where?

DEBORAH BALL: It stops at the word “field.”

CHAIR FAULKNER: Stop before “by incorporated?”

DEBORAH BALL: Yes, because that's an insertion from another report. That's not from our --

CHAIR FAULKNER: Okay. So, you're saying it should read that, "A sharp focus be placed on systematically improving teacher

preparation programs."

DEBORAH BALL: As well as professional development strategies.

CHAIR FAULKNER: So, how are we going to do that?

DEBORAH BALL: Period, right.

CHAIR FAULKNER: Do we give anybody any advice on how we would do that?

DEBORAH BALL: So, maybe this isn't a finding. If you want a finding, we have to re-write it to say that we weren't able to identify those processes that would do that. That's when you get back to a call for more research.

CHAIR FAULKNER: Well, you've got to go to a research call --

DEBORAH BALL: Then you'd have to do that.

CHAIR FAULKNER: You can't just tell people to do without --

DEBORAH BALL: If you want to do that, then you could keep some version of what begins with “a well designed program,” but you'd have to delete the middle part on by incorporating more

rigorous research on student learning. You'd have to delete that, because that doesn't come from the Teacher Task Group report.

CHAIR FAULKNER: Yes, Valerie?

VALERIE REYNA: That actually was intended to come from your statement that you added to the synthesis document. It's a briefer version, we thought, of what you said for that document.

This was again, an attempt to, as you say, integrate some of the things in the one task group and some of the things in the other, but you had some wonderful phrase that you typed up during the synthesis, that Doug actually has on his computer somewhere, that this is supposed to be a summary of.

You said we should put into the hands of teachers, the results of all of this work that the Learning Processes group summarized in those 200 pages. That was a point that you made.

DEBORAH BALL: No, I don't --

VALERIE REYNA: And obviously, in many professions, agriculture, medicine, many others,

if we want practitioners to do evidence based practice, we have to make the evidence readable to the practitioner. So, that's the basis for those points.

You're right, it does attempt to integrate a little bit across the task groups. But I thought the time for that is probably now.

CHAIR FAULKNER: All right, Sandy?

SANDRA STOTSKY: If we were talking about things coming from out of nowhere, this too, comes from out of nowhere. There's nothing in the report itself that is the basis for this, so far as we can see here. There's nothing that says a sharp focus needs to be placed on systematically improving teacher prep programs, in the report.

There's nothing that indicates that we need to have a sharp focus on professional development strategies for teachers already in the field. In fact, the review of the research suggests that there's almost no evidence, statistically positive evidence, for professional development.

So, this has no basis in the research

report itself, as far as evidence. So, we should be deleting this entire item, so far as I can see.

CHAIR FAULKNER: Deborah?

DEBORAH BALL: I'll try to trace the logic of this and we, obviously, need some re-writing here. The report is filled with observations about the lacks in students' knowledge of fractions, knowledge of other aspects of mathematics and we make a strong effort to learn what we know about how to instruct students better, both from the research on learning and research on instruction.

This is the analog. We have a report that shows that teachers often don't know the mathematics that they need to teach. So, it's very reasonable that we've reviewed the research to learn what's known about how to educate teachers to know what they need. We were not able to show that we know enough yet about that.

So, it would make no sense for us to say anything, other than we have to find ways to educate the enormous population of teachers who have to teach children effectively. We're going to

have to figure out a system in this country to do that and we've actually had quite a bit of e-mail discussion and we discussed this at the meeting in Phoenix.

So, we'll have to find a way to write about it clearly, but what we did was investigate what's known and found that we don't know nearly enough about research on learning, how they can learn it, how they can use it, how to equip them with the knowledge of math that we were able to show does matter.

So, it's really quite clear that the report will point directly at the need for us to find out how to educate teachers much more reliably in mathematics and in learning and in other things. So, this has to be written in a way that draws from our efforts to learn about what's known and points to the need to improve the system of educating teachers.

It's exactly the same thing we do when we find students that have difficulty learning. So, it's, to me, the logically analogous point.

CHAIR FAULKNER: What about that last

sentence, Deborah? Bob, I interpreted one of your e-mail messages, that you didn't like that last sentence, and I'm not absolutely certain that I have interpreted it properly.

ROBERT SIEGLER: Yes, that's true. I don't care for that sentence, for a couple of different reasons. One is that there are measurement problems all over and we don't know that measurement problems are a unique source here of the relation not appearing as strong as our intuition says it might be. Maybe our intuitions are wrong.

Maybe things like explanatory ability or charisma of teachers, in getting kids motivated, are what really matter in mathematics learning K through eight.

My own guess, like most of the Teachers report, is that it probably does matter more than has been documented, but we don't know that. That's just purely speculation and to say we need better measures here and not say it -- we need better measures of everything.

DEBORAH BALL: We actually have the

point about measures now, under the mathematical knowledge item that we discussed a few minutes ago. So, we don't need it here. This should be a clean point about teacher education and not about measurement, and we don't need it here because we agree to put it earlier, under the teacher knowledge stuff.

ROBERT SIEGLER: Okay.

DEBORAH BALL: I think it can be deleted here.

CHAIR FAULKNER: All right, I do want to give time to talk about other things. Let me have a show of hands quickly, on how many of you could stay until 3:30 p.m.

What I'm going to propose is that we go ahead and run until 3:30 p.m. At least we'll have the benefit of the discussion from the people who are here and those of you who can stay, can stay and those of you who cannot, will not.

I'm not leaving until 5:40 p.m. on a flight and Skip is not leaving until then either, so I know he can stay.

FRANCIS “SKIP” FENNELL: Larry and I

are going to write the report. We'll see you.

CHAIR FAULKNER: It won't be decided in the end, you're all going to see this stuff again anyway. Dan?

DANIEL BERCH: Larry, if we can do that. If I understand right, we're trying to get up to number 45, is that correct, the end of the executive summary? So, if we're going to leave at 3:00 p.m., that leaves us approximately one minute per item and at the very least, in order to make sure that we have a quorum, if that applies here, could we try to at least quickly go through those that we think will require some sort of vote, as opposed to stylistic change, because otherwise, we don't know how many are left?

CHAIR FAULKNER: I haven't discovered any that only required stylistic changes.

DANIEL BERCH: Okay.

CHAIR FAULKNER: Let's go ahead. Okay, Wilfried?

WILFRIED SCHMID: Well, on this question, certainly, before we started with the executive summary, we had a presentation about the

technology report and a number of points were made then.

I think there should be an understanding that the points that were made then should be incorporated and if we have that understanding, then already, we go pretty far on instructional practices.

The other thing I would like to say is that in the teacher section in the executive summary, professional development occurs only very peripherally. Now, I'm not sure what can really be said about professional development, but it's a huge enterprise and certainly, many of us are deeply troubled by what goes on in professional development these days.

So, I am unable to suggest anything specific, but it seems to me, this is a glaring hole and I hope that something can be said about professional development, if only that there is a tremendous outlay and very little evidence that this outlay is really achieving what it's supposed to.

DEBORAH BALL: I think we could

strengthen it to say something about that. I think we can find a way to deal with it that doesn't lead logically to the conclusion that we shouldn't be educating teachers.

The fact that we don't currently have systems reliably doing that is an important point. Some people seemed to say that suggests that we shouldn't educate teachers. That can't be right.

So, we need a way of saying that we need to develop systems that actually do equip people with the skills and knowledge they need, both free service and in service. I think we can say that, based on what we have.

WILFRIED SCHMID: Yes, but I would be happier if there were separate items specifically devoted to professional development.

DEBORAH BALL: I think we could probably do that.

WILFRIED SCHMID: And you could certainly repeat the assumption of self-evidence for certain things.

DEBORAH BALL: Yes, we can do that.

WILFRIED SCHMID: Maybe that

professional development should be focused on providing teachers with knowledge of the mathematics they teach.

DEBORAH BALL: Well, I think we can do that.

SANDRA STOTSKY: Could I just address that quickly?

CAMILLA PERRSON BENBOW: All right.

SANDRA STOTSKY: We're talking about two kinds of professional development and most of what is at issue is what I have labeled remedial professional development. We can find other words for it.

But the major issue is the amount of money that is being spent on remedial professional development for elementary and middle school teachers, teachers who are academically under-qualified in mathematics. That needs to be sorted out.

The kind of professional development that nurses, doctors and others take, which is basically enrichment updating in the field, that is not what is at issue. The vast sums are now

being spent on trying to help teachers who are elementary and middle school, who did not acquire the mathematical knowledge they needed, scientific teachers as well, and to use professional development as the way to instill this knowledge, and there's no evidence that it's worked.

That's the part that needs to be addressed. To say that we need to continue because they need continuing education doesn't get at the issue that this has been a failed strategy, so far as we can tell from the research, and that maybe we need to think about other ideas and policies that get at the remediation or maybe the firing of ineffective teachers.

There's another whole issue that we haven't even gotten to, and that is maybe we need to fire elementary teachers who simply are inadequate. But we --

CAMILLA PERRSON BENBOW: We seem to just by-pass it and say we need a few more --

SANDRA STOTSKY: Dollars into a failed policy.

CAMILLA PERRSON BENBOW: How about,

since we have so many other recommendations, could I ask Deborah if she could craft something about professional development, swing it by all of us and incorporate these points.

I'd like to be able to move us on to number 21, which is another debated point. So, if we could move on to 21, about schools should be encouraged to pilot the use of full-time elementary mathematics teachers for direct instruction. Okay, Bob?

ROBERT SIEGLER: The point here seems at odds with itself. On the one hand, it says there's no research to support this, and then it says schools should be encouraged to do it.

I think it makes sense to recommend research on this topic, but as a policy for schools to adopt, on any kind of major level, what's the evidence?

CAMILLA PERRSON BENBOW: Wilfried?

WILFRIED SCHMID: Well, I don't think it is evidence that leads to the recommendation. What leads to the recommendation is a practical consideration. What we do have evidence for is

that subject knowledge of many elementary teachers is inadequate and that let's say, the pool of mathematically qualified elementary teachers is just too small.

There is a practical reason for having math specialists, because then, we may be able to make due with a smaller number of well-educated elementary math teachers, and I think that has to be the reason for the recommendation.

CAMILLA PERRSON BENBOW: Bob and then Russell.

ROBERT SIEGLER: To me, it seems, just to answer Wilfried, very plausible and even likely to me, that the same people who are good math teachers are also good reading teachers and good science teachers. They're smart, motivated, creative, charismatic, whatever combinations lead to them being good teachers, and if we make them full-time math teachers, it means leaving the others to do all the other teaching.

Now, we're focused on math and so, to us, this isn't such an unappealing possibility, but if you think these abilities to teach are

correlated across fields, then I really think that this argument is very questionable.

WILFRIED SCHMID: I think first of all, yes, we are focused on mathematics and I think that probably, we can agree that in elementary school, the subjects that we really need to worry about are mathematics and reading, and maybe there is an overlap. Well, perhaps we also have to have reading specialists, but that is not for us to say.

So, I still think that from the point of view of having actually mathematically well prepared elementary school teachers, there is a practical argument to be made for math specialists.

The other reason for mentioning it, although that shouldn't go into the text of the recommendation, is that on the ground of course, there are many models of math specialists that we don't like and we don't like for good reasons, math coaches and so on.

For those, there is really no good, even practical reason for engaging in these

practices. But it seems to me there is a good practical reason for math specialists, and somehow, that should come across.

CAMILLA PERRSON BENBOW: Russell?

RUSSELL GERSTEN: This is more of a procedural suggestion. I think what we can say and what we should say and what the report itself does say from the group is, there is no research on this, but we can state the opinion or in the view of the Panel. So, I think we need to use that language there.

I think where we have a decision to make about a recommendation -- and I just go back and forth myself, is we can say schools should do this or we could say districts should experiment or pilot use of such a model.

I could go either way, but I think those are our two key decisions to make, as a large group.

CAMILLA PERRSON BENBOW: Skip?

FRANCIS “SKIP” FENNELL: The analogy I made this morning, relative to so many middle grade kids doing algebra at the eighth grade level

exists here as well, and that is, the train left a long time ago.

There is a tremendous need for specialists in the field of mathematics at the elementary school level, in particular, on into the middle school level and some, frankly in this room, would argue for similar kinds of specialists in a different manner, even in high school mathematics.

The point rests on the issue of the background of existing staff. Now, this task group, the Teacher Task Group, examined all of the current models, the coaching model, the specialist model and so forth, and came up with the teacher specialist model as the one that is most attainable at this time, indicating as well, that there's a tremendous need for research in this area. At a time when virtually every state in this country certifies somebody called a reading specialist and such people are in schools all over this country, it’s about time we make a similar investment in mathematics.

That, I think, is what the task group

recommended and what they did in this piece is say the teacher specialist idea makes the most sense at this time.

CAMILLA PERRSON BENBOW: Dan?

DANIEL BERCH: I want to go back to Bob's original point, because I'm a little concerned that as a Panel, at least some of us, pride ourselves on our ability to use mathematical logic. I swear, if we had tried to put this in the logical form it really wouldn't look very good, but there would be something to the effect that we have no evidence to validate or invalidate the effectiveness of full-time elementary mathematics teachers. Likewise, we have no evidence about mathematical coaches.

However, if we want to ignore the evidence, we can say that one is more realistic and less costly. So, on the basis of ignoring the other evidence, why don't we go ahead and put our efforts into piloting something? It just doesn't follow. It doesn't mean that there's not a good point in there somewhere, but I'd rather vote on it, if I saw the logic in a much more readable

way.

CAMILLA PERRSON BENBOW: Wilfried, Deborah, Sandra.

WILFRIED SCHMID: But that's exactly why I am stressing that we can make an argument on practical grounds. That's exactly the reason, and I think Skip will agree that that is also a big reason for him.

So, I don't think that you are being fair here. Well, sure, there isn't a whole lot of evidence. However, what we do know is that there is a need for mathematically trained elementary school teachers and the question is, how do we get enough of them?

Well, one way of getting more kids exposed to them is to have mathematic specialists. So, I think that is an argument that uses practicality, which does point towards specialists and does not point towards math coaches.

DANIEL BERCH: But that's again, departing, to some extent, from our standards of evidence. In this case, it would lead me to go back and say, "Well, let's re-visit some of the

other recommendations where we didn't have evidence either," and take a look at what we might decide to do on the basis of practicality.

WILFRIED SCHMID: But we are, as a Panel, we are asked to make recommendations and those recommendations, at times, have to be informed of what is practical and what's possible.

DANIEL BERCH: Well, we're supposed to make recommendations, based on the evidence. When we agree that the evidence isn't there, we --

SANDRA STOTSKY: The wording is wrong here. This is something --

CAMILLA PERRSON BENBOW: Microphone.

SANDRA STOTSKY: The wording is wrong here. There is no research on the full-time elementary math teacher. This is the way this should have read, that there is no research to either validate or invalidate. In other words, it's a new idea. It has no research. However, there is research on the mathematics coach, but the evidence from it is not positive.

So, there's negative evidence on one. There's no research on the other. That should be

clearer here, so that therefore, that leaves open the possibility of exploring an idea, for which we have no research.

CAMILLA PERRSON BENBOW: Deborah?

DEBORAH BALL: No, that's not quite right, actually. We weren't able to find studies of math coaches that met our standards. So, we don't have negative evidence of math coaches. Wilfried is right, that the basis for the task group's interest in this was the logic of the scale problem and since in other parts of our report, we do rely on other kinds of logic, your question about logic is a good one.

So, we go from the finding that mathematical knowledge is a predictor of student achievement, that we see a strong signal for that and we have this problem of having an inept educational system to prepare teachers, especially those already in practice, with sufficient knowledge.

So, it's a good bet to think about narrowing the pool of people who would need to be provided with that kind of knowledge to do that

work. That's why the bet is there. It's a logical argument.

That's what had led quite a few people to be interested in this, but it's true that it doesn't grow out of evidence one way or the other. It's a solution, based on the scale problem and the evidence about mathematical knowledge, which there is evidence for.

CAMILLA PERRSON BENBOW: Bob?

ROBERT SIEGLER: I agree with Dan's point, but couldn't we still get at this by starting with Dan's point, that there's no evidence. However, we need to gather evidence.

So, the pilot, which is an experiment, that we're encouraging, further experimentation with this idea to fill this void --

SANDRA STOTSKY: So, those studies did not produce positive evidence for math coaches. But there was no research at all, on the elementary math teacher. That has to be distinguished.

ROBERT SIEGLER: I agree with Tom's

point and Dan's, that this is a very good problem to do research on, but it isn't just the wording here. When we say schools should be encouraged to pilot, that's a very different level of implementation than some researchers ought to study this.

This means schools all over the country should try this out and see how well it works, and there just isn't the evidentiary base for us to recommend anything like that.

CAMILLA PERRSON BENBOW: All right, Skip?

FRANCIS “SKIP” FENNELL: There are people in this room right now, who do this job and this is all over the place. At the very least, we need to say that this needs investigation and what I think they tried to say is, this piece of it, resting back on the content knowledge of math teachers at this level, is something that is probably a safe bet.

Have the person who knows math, have the person who likes math at the fourth grade level, teach all the fourth grade mathematics.

That's different than a lot of other models that they also take a look at and question pretty deeply, I think.

ROBERT SIEGLER: Another dimension of the issue though is if the teacher isn't teaching their original classroom now. They're teaching math in all the other classrooms, as well as their original one. It would seem this means hiring additional teachers to pick up their classes

HUNG-HSI WU: No.

ROBERT SIEGLER: So, how would this be done then? What are you going to do with those students who used to be taught by the best math teacher at each school?

DEBORAH BALL: It's a departmentalization model, where the teachers are --

ROBERT SIEGLER: But then it would be -- we're talking about a re-organization of the entire basis of elementary instruction, not just math. If you're going to do it without hiring more people, you need to do it in every subject.

CAMILLA PERRSON BENBOW: Are we leaving

today at 3:30 p.m. or tomorrow at 3:30 p.m.?

WILFRIED SCHMID: Before, Skip said something that I think is quite relevant. So, you said that reading specialists are common. If they're common and if there is evidence that they work, then certainly again, you can very much make an argument on practical considerations that what works in reading is likely to work in mathematics for very similar reasons.

CAMILLA PERRSON BENBOW: Okay, I think we're at a point where we're not going to be able to resolve this today, in terms of language. I think what we can decide on is whether we should have a point about math specialists in here.

If we decide to have a point about math specialists, I think we will get a group together off-line to craft language that would be acceptable to the group.

So, what I'd like to do is a poll to see how many people think that we should have some language about math specialists in the report, not necessarily this language, but some? How many people would want to do that?

Okay, looks like pretty much a majority. How many people think that we should not have any language about math specialists? Bob?

Okay, all I'm saying is, we're not going to, right now, craft language. We're going to, I guess, appoint a group. Deborah, Skip, Wilfried and one more person, Sandy? Okay, Bob, do you want to be part of that? Valerie? All right, and Valerie will be part of that group, to craft some language that we will all try to approve later.

Okay, then we need to move on to number 22 -- and Vern too, okay, sounds good. Okay, on to 22. Back to you.

CHAIR FAULKNER: This is “the teacher's past effectiveness in the classroom is by far, the strongest predictor of future effectiveness.” Questions or comments? Bert raises the question of who is the judge, but that's of course, always a question.

BERT FRISTEDT: Well, I raised it especially because you'll see from the Assessment

Task Group that the state and NAEP assessments are not that great. So, if they're used as a criteria, there's an issue there.

CHAIR FAULKNER: All right. Okay, but I'm hearing people say that they're willing to just stay with that language. Yes, Valerie?

VALERIE REYNA: On-the-job measures is so vague. Something about learning, correcting for the obvious things that value added measures would correct -- we want to put that in English, as opposed to saying value added measure. We need to have something about the learning outcomes of the student, as opposed to just a subjective evaluation on-the-job. I'd be happy to come up with that.

CHAIR FAULKNER: Work on it, okay. Okay, then the next one is mixed evidence on influence of salary schemes and so on. Any comments on that? Sandy has an alternative. School districts should be encouraged to pilot and carefully evaluate a variety of salary schemes for supporting teacher's effectiveness and then basically, it's the material from this point.

There is a push associated with this, which is basically just a finding. Exhaustion is setting in. Dan?

DANIEL BERCH: Just have a more general point, and I'm not sure, solution. But recalling that this is main findings and recommendations, I think it may be confusing to sometimes see recommendations embedded at the end of a finding and sometimes, there is not a recommendation, but there is a finding.

So, perhaps we need to think about saying “main finding.” Here is a recommendation that flows out of it, or re-grouping, because at times, we seem to be saying, "Where is the recommendation coming out of that," and sometimes we say, "Well, we don't need one. We don't have one," and other times we say we do, and I just don't know how that will look when you first read it and that's not split out in some way.

CHAIR FAULKNER: Well, I think it's tedious to do, put recommendation one, finding one and then --

DANIEL BERCH: Well, it may be tedious,

and that's why I said, I'm not sure that that's a solution. But I am --

CHAIR FAULKNER: But the problem is that recommendations flow from findings.

DANIEL BERCH: Right, but we have findings that don't lead to recommendations sometimes and we found ourselves pushing ourselves to make a recommendation, because it seemed like something needed to be there, and I'm just saying that somebody needs to look that over, once we've finished this exercise and say, "How would that read to someone else?"

CHAIR FAULKNER: I have a feeling that all of you will look it over.

CAMILLA PERRSON BENBOW: I would have a problem with the addition. I think that in order to conduct really rigorous research, you don’t have to ask school districts to experiment with various proposals.

We do have a center for pay-for-performance at Vanderbilt. It is a randomized controlled trial. It's rigorously designed. It's involving mathematics.

I think if we're going to be doing things like that it needs to be at that kind of level. I think we have learned so far, in all of this, that we did not accumulate much evidence over time and I think therefore, just to say school districts should experiment, I am not convinced that we'll learn much from that.

CHAIR FAULKNER: I'd like to second that. I think one think that I've observed, on the basis of this experience, is the phenomenal degree to which this country will alter its educational system on the basis of no evidence at all and we would never do that with the banking system or National Defense or other things, and yet, this is probably just as important.

I think we probably shouldn't be in the business of making recommendations that we can't support on the basis of evidence.

DOUGLAS CLEMENTS: I agree with Camilla completely, but I would like to add that if there's any other alternate wording somewhere, where we can say that these have to be school-based/classroom-based studies.

I'm just saying that I would love to encourage schools to still participate in the research, under the direction of a researcher and that's not always easy to do.

CAMILLA PERRSON BENBOW: I think that's a very valid point because it is very hard now a days to get into the schools to do research in schools. They don't want us in there.

CHAIR FAULKNER: Okay, well, that gets us through Teachers, sort of. Yes?

A. WADE BOYKIN: Just one comment --

CHAIR FAULKNER: It almost got us through Teachers.

A. WADE BOYKIN: Almost. Very short. The last sentence there, this weak statement about pay-for-performance, I'm just thinking out loud that from what I understand, National Education Association (NEA) has come out very, very strongly against merit pay for teachers.

This is going to put a bull's eye on the back of the Panel, for better or for worse, and we have a statement that's put into the executive summary, that doesn't really have strong

evidence to support it. Do we want to necessarily take this on, or should it just be put into the body of the report, not in the executive summary?

CHAIR FAULKNER: Ask the Panel to decide?

A. WADE BOYKIN: I ask the Panel, yes.

VERN WILLIAMS: Good point, but I hope we don't base our report on the NEA.

A. WADE BOYKIN: Okay.

CHAIR FAULKNER: You were about to say something, Valerie, I can tell.

VALERIE REYNA: You can hear me thinking. It really does require a careful look at the quality of the evidence. We should not say things, simply because they're controversial. But I think you're right, they should be considered.

I mean, we really ought to take an in depth look at what's the strength of evidence there. So, maybe that's something we should table and re-visit.

CHAIR FAULKNER: Okay, let's move to Instructional Practices, number 24, all encompassing recommendations that instruction

should be more child-centered -- or teacher-centered are not supported by research. Where are we on that?

TOM LOVELESS: I think that still survives. There have been questions raised about whether the two middle sentences are too stern. If such recommendations exist, they should be rescinded. If they are being considered, they should be avoided.

But I think within the IP group, the first sentence, the topic sentence, the basic idea that these sweeping recommendations are unsupported by research still are agreed upon.

JOAN FERRINI-MUNDY: Right, I would just suggest -- sorry.

CHAIR FAULKNER: Go ahead, Joan.

JOAN FERRINI-MUNDY: Just a small edit, because the language is child-centered or teacher directed.

CHAIR FAULKNER: That's the --

JOAN FERRINI-MUNDY: And I would concur with maybe striking the second two sentences.

WILFRIED SCHMID: Well, actually, I

would very much argue that in this particular case, the stern tone is more than appropriate.

TOM LOVELESS: We will have you do the audio book.

WILFRIED SCHMID: The evidence is substantial and therefore, it is appropriate to make a loud recommendation.

CHAIR FAULKNER: Bob?

ROBERT SIEGLER: Yes, I agree with Wilfried and Tom. I think the stern language here will get people's attention, which it should.

CHAIR FAULKNER: Doug?

DOUGLAS CLEMENTS: I'd like to ask the authors if the evidence is that substantial on that particular issue and that statement of it, and if we should include one of the middle sentences.

JOAN FERRINI-MUNDY: As we know in the IP group, what's complicated about this is the definition of child-centered and teacher-directed that's being used.

And so, this is very much short-hand for a much longer and I think, more complicated

set of discussions, and so, the problem with keeping both of those sentences in their current form is that it sort of assumes there is some well defined agreed upon meaning for child-centered or teacher directed, that I think we're not really seeing in the literature.

TOM LOVELESS: But I think that's taken care of in the first sentence, and that is the all encompassing recommendations and the fact is, when we did this literature search, we came up with over 100 studies, I think, initially, and once you boil them down, there just aren't that many that examine strictly, the contrast between student-centered and teacher-directed.

So, the fact that we identify this as all-encompassing recommendations, if such recommendations exist, and we are hearing from the field that they do, I think that does support the stern language.

DOUGLAS CLEMENTS: But it seems to me that if the evidence, as you've just said, is limited and the definition unsure, then the stern recommendation is based on very shaky grounds,

first of all.

Secondly, I don't know if I like the wording of the “all encompassing.” I'm not sure if I know it should be more child-centered, more than what? What are we saying? They're all encompassing recommendation could be to a school saying, "Guys, you got to be a little more teacher directed," and that would be an all encompassing recommendation that they should be more, compared to what?

We don't have to discuss it here, but I would think that we still need to work on the phrase.

CHAIR FAULKNER: Well, I wonder if the word “more” is what should be taken out.

Take out “more?” All right, then I've got Wade and then Bert.

A. WADE BOYKIN: Yes, for the number 24, when I read the first sentence, I infer that there are just no findings from the research. When I read the fourth sentence, I get the impression that there is just bad research.

Are those connected? Are those two

different points? Is it the fact that it's not supported by research, because there are just no findings? I'm not really clear, looking at those two sentences together.

TOM LOVELESS: It's both. There just aren't that many good studies and the good studies that do exist are neutral.

CHAIR FAULKNER: Probably, we should say that.

VALERIE REYNA: This is again, a similar point I made earlier about variability. Taught to use the full range is not necessarily going to mean that you'll somehow capture the signal in there.

Instead of getting 100 percent of it right, you might get 50 percent of it right, because you used a full range of zero percent effective and 100 percent effective approaches.

So, this notion that just sort of doing everything is a solution to not knowing, I'm not sure I endorse.

TOM LOVELESS: It's definitely not suggesting that. Again, the topics here are

directives that are coming down, as to you should do X because it is supported by research. What we're saying is, we really did an exhaustive search and we can find nothing that would support either direction on that.

VALERIE REYNA: Yes, and I was speaking to 25, the top of 25, which he alluded to in his statement.

RUSSELL GERSTEN: Twenty-five has not been discussed or approved by the whole group.

A. WADE BOYKIN: Are we voting on 24 or what?

CHAIR FAULKNER: Are we what?

VALERIE REYNA: Voting on 24.

A. WADE BOYKIN: So, we're not done yet?

CHAIR FAULKNER: No, we're not done yet.

BERT FRISTEDT: Just a comment on 24. The fact that student-centered and teacher-directed are ill-defined, is actually another reason to make a stern recommendation that there not be messages out there that are advocating

something that will be read by some people quite differently than by others.

RUSSELL GERSTEN: Bert, on that point, they were well defined in the 1970's, in the reviews of that era. I think the field has shifted, but they were well defined during that era by Flanders and Goode and Brophy and Rosenshine.

So, it's kind of now, how do you fit things, which is, I think, what Tom and the team struggled with, with this term that was really kind of a critique of the progressive model of the 60's, where children's interests set the curriculum, at least that was the theory.

So, they were well defined, but no longer are.

CHAIR FAULKNER: Liping?

LIPING MA: I just have a question. Do we have to put these two phrases as either or? I don't understand. Is it possible that there’s a balance between student-centered and teacher directed?

CHAIR FAULKNER: I think everyone would

agree that it's possible to achieve a balance, but there are, it appears, in some organizations, maybe in many organizations, pretty strong directives of the kind that have been discussed here. I think that's what the question is, whether those are justified and the research doesn't really address that.

TOM LOVELESS: We did not look for what's the best form of direct instruction or teacher directed instruction? We did not look for what's the best form of student-centered instruction?

We looked for studies that contrasted student-centered with teacher-directed and in order to do that, yes, they really have to be posed as contrast.

CHAIR FAULKNER: Dan and then Wilfred.

DANIEL BERCH: On this general notion, we're making a strong recommendation here, perhaps the strongest we've made anywhere. You avoid other strong recommendations about two kinds of instruction that we haven't defined very clearly, for research that wasn't done well and in other

cases, was done well and didn't tell us. Which of these two things we haven't defined clearly, is better than the other.

I'm sorry, but if that didn't sound logical. If we're going to use these labels, I think we're obligated to at least, hopefully briefly, define them in the ways that we think are these sort of extreme examples and then say that's what we're talking about, using words like totally or predominantly, but without that --

TOM LOVELESS: And we've had discussion and disagreement within IP, just about that very issue, with some people taking the stand. I'm the person who takes this stand. The important thing was to look at two instructional regimes where in one instructional regime, the student was doing the bulk of the teaching. The students were teaching each other. In other instructional regimes, the teacher was doing the bulk of the teaching.

Now, that doesn't mean 100 percent, necessarily, but the contrast was large enough to where there obviously was a contrast. That's the

body of research that's very small and doesn't show significant effects.

But again, we're hearing out in the field and there are cases in the field, of teachers being told and of directives being made, that you should be child-centered. You should be student-centered in your instruction. You should be teacher-directed in your instruction.

Policy is a meat ax, it's not a scalpel, and unfortunately, the research in this field supports scalpeling, but not a meat ax, and that's what we're getting at.

CHAIR FAULKNER: You might have to define a meat ax or a scalpel. Joan, you have your microphone on. Do you want to make a point?

JOAN FERRINI-MUNDY: Yes, I was just going to say that we really still are grappling with these issues and these questions and I would propose that maybe we let the IP group members who are working on this, try another pass at it, having heard the sense of the group.

WILFRIED SCHMID: I think that what Tom said is exactly right, and it's true that we don't

particularly define, but out in the field, there are programs that in effect, say you have to use a student-centered approach and they don't define it very well either. So, therefore, the recommendation as phrased, seems entirely appropriate to me.

I should say that Wade made a point where I see some reason for responding, but I would propose that this is a hot button issue, where we should take a vote. I would propose that we have a vote on having this phrasing with an adjustment on the matter brought up by Wade, but otherwise, stern and all as is.

CHAIR FAULKNER: Are you making a motion?

WILFRIED SCHMID: Yes.

TOM LOVELESS: So, your motion is to perhaps, some minor edits that Wade suggested in the final sentence, but delete those two middle --

WILFRIED SCHMID: Yes.

TOM LOVELESS: Okay.

VERN WILLIAMS: I'd also like to add that teachers are evaluated at times on how child-

centered they are.

CHAIR FAULKNER: Are you -- is there a second?

FRANCIS “SKIP” FENNELL: The thought that a teacher of mathematics at any grade level is so polarized in one of these positions is amazingly unrealistic and I'm sensing that's where we are here.

In any classroom, any teacher uses elements of this, and so, I don't sense that that stern language is getting --

WILFRIED SCHMID: But we are talking about all encompassing recommendations. That's what we are talking about. We are not talking about individual teachers. What we are saying is that if program X says all teaching ought to be done in an entirely student-centered manner --

FRANCIS “SKIP” FENNELL: And you're suggesting --

WILFRIED SCHMID: -- that is --

FRANCIS “SKIP” FENNELL: And you're suggesting there are programs out there that say exactly that?

WILFRIED SCHMID: Yes, indeed. That's why I would like us to have a vote.

JOAN FERRINI-MUNDY: Could I just chime in on that? It would really help us to have some of those cites, actually. We're going to need it for setting this up in the report and we've got a couple, but --

HUNG-HSI WU: But these statements --

JOAN FERRINI-MUNDY: Yes, we need policies in print, ideally, that could be referenced, that have these kinds of statements, because it helps to clarify what we're meaning by these terms.

CHAIR FAULKNER: Valerie?

VALERIE REYNA: Point of information, however, to address Dan's earlier point. My understanding of the literature, but please correct me if I don't have this right, is that there were at least some studies, for which these concepts could be defined and that for that small body of studies, there wasn't a clear winner here. It's on that basis that this is addressed, and I think this is like the statement about the Piaget

example earlier, that we're responding to what's assumed out there in some quarters.

I would also add that it's not just teachers we're talking about. We're talking about theorists and educational researchers and other people, as potential audiences for this kind of recommendation.

So, I think it's a little bit better than the way it was characterized in the summary statement. There really is some evidence. The evidence is acceptable and it doesn't clearly indicate that one is superior to the other. If there really is a presumption out there, that one is superior to the other, I think we perhaps, should address it.

SANDRA STOTSKY: Could I just add a word here? In response to what Joan just said, I can supply you with material that was just presented to the State Board of Education in Massachusetts yesterday by superintendents and other administrators, who are defending or explaining their schools system's response to the designation of being under-performing or low

performing. They are very clearly talking about moving their curricula and their schools into the direction of more student-centered or child-centered, buying materials that are more student-centered or child-centered.

It's clearly a very current and frequent buzzword of these people, but it's always in that direction. Nobody, I have seen so far, for several years, has ever talked about --

DOUGLAS CLEMENTS: Buffalo public schools -

SANDRA STOTSKY: -- teacher directed part of this --

DOUGLAS CLEMENTS: -- all teachers, including pre-K teachers, do direct instruction. So, it's not true that it only goes in one direction.

SANDRA STOTSKY: I'm just saying, I have only seen it coming before State Boards in one direction. It could be in the other direction, but I certainly can give you examples of it coming in that direction, and it's very commonly designated only for elementary and middle

school. It's really not a high school issue that much, although it may be in the English class these days.

But certainly, for elementary and middle, which is why I'd like to have that made clear throughout our report on whatever we're talking about.

TOM LOVELESS: Well, if any of the Panel members who are aware of these examples, like Buffalo and Massachusetts, please send them to us, because what we need to do is put those in the body of the main report.

CHAIR FAULKNER: I think that would be helpful. We're going to need some additional work, but we have Wilfried's motion on the table, although it has not been seconded. All right, there is a motion and a second. Are you ready to move to a vote?

Essentially, the motion is that the point that should be captured essentially is written with refinement to deal with the questions that Wade raised?

WILFRIED SCHMID: The last sentence.

CHAIR FAULKNER: Okay, all right. Dan?

DANIEL BERCH: I'm going to vote against it, despite the fact that I would like to have some statement in there like that. The reason I will vote against it is because I believe without pointing fingers and mathematicians in this group have always talked about the importance of precision. What I hear being stated here is that, "Well, you people use those terms out there in the field, student-centered and teacher-directed." You don't necessarily agree on what that means or know what you mean by it.

We're not sure that we know we mean by it, but we're going to make a strong recommendation about what you shouldn't do about that and we're not going to clarify what we mean by it. I just think this is unacceptable.

FRANCIS “SKIP” FENNELL: I don't think that's --

TOM LOVELESS: That's just not true. We do, in the body of our task group report, talk about not only the definitions, several definitions that are used, but we're even now

putting in historical material of how these definitions have changed over time. As Russell pointed out, they're quite different in the days of the 70's as they are today. So, the definitions are discussed.

HUNG-HSI WU: We've gone over this several times. Can we just vote?

CHAIR FAULKNER: Let me comment, just one more time on this. I think that it's true that the material is defined in the body. The question then is, does it need definition here and my sense is, probably not. This is a broad enough public debate that all we need is the actual statement.

But we're ready to vote. Those in favor of the motion that Wilfried has made, which is to retain essentially, this recommendation, tweaked, please signify by raising your hand.

All right, and those opposed, please raise your hand. All right, okay, I think we have a clear intent to proceed with this recommendation and I'd like to get to at least 25 before we break up, because 25 is an item where there's been some

back and forth on whether to keep it.

The item is that teachers should be encouraged to use and taught how to use a full range of instructional and assessment strategies from direct instruction to small group work, both formative and summative assessments and so on.

Is there a sense on this? Essentially, I think Sandy's proposing this as a derivative of 24.

SANDRA STOTSKY: Actually, it's also intended to encompass the fact that there was very little that was found to be totally positive for any of these strategies. Most of them had so many qualifications and limitations that it would leave teachers with a negative feeling about doing anything.

For example, assessment, if I recall, Russell, correctly, was elementary school. That was where I think you said --

RUSSELL GERSTEN: Right, that's correct. That's six of our eight target grades.

SANDRA STOTSKY: Okay, and then we got to the student assisted learning strategy. I was

just trying to get the qualification in, which isn't here. It was a particular one out of five different types of small groups that actually had a positive effect on student's learning. When we looked at, for example, real world problem solving, it had all kinds of conditions attached to it.

So, you would end up with not feeling comfortable about any of them. The basic over-riding idea should be positive that teachers should be encouraged to use a full range and that would be a positive way to state something that comes through as very negative in all of these.

CHAIR FAULKNER: Russell, then Skip.

RUSSELL GERSTEN: A couple of things. Because half of our reports have not been completed, there are other things that have positive outcomes. Peer-assisted learning does have significant outcomes --

TOM LOVELESS: It's peer-assisted individualization.

SANDRA STOTSKY: It's only one kind.

RUSSELL GERSTEN: But you're working on

the earlier analyses, Sandy, so there are two, at least two types, that do. Also, there are all kinds of approaches for low achieving students, which is about a third of our target population that are effective.

The problem with that number 25 is just the typical bromides that people have been living with in education. There's no evidence showing a teacher who does this any better. So, why put more bromides in. It's like, this and 15 cents will get you on the subway, kind of thing.

It gives no guidance to teachers and it's not linked to our research.

TOM LOVELESS: This did not come out of our task group and I'm concerned about the phrase “a full range of,” because that's exactly what the research doesn't show and the other thing is, the qualifications are important.

Team assisted individualization was not effective with teaching math concepts. It was not effective with teaching problem solving. It was effective with teaching computation skills, and that's important to know.

FRANCIS “SKIP” FENNELL: Also, the group of students and the teacher's teaching style.

CHAIR FAULKNER: Joan?

JOAN FERRINI-MUNDY: Yes, it really wasn't a kind of recommendation that our group has discussed at all. So, I guess, perhaps, we could vote as a whole group. We cannot arrange the research in any way that would let us make such a recommendation.

CHAIR FAULKNER: Skip?

FRANCIS “SKIP” FENNELL: I would urge that the Panel delete 25, in the hopes that the full analysis of 24 and the formative assessment analysis sort of addresses much of this anyway, based on the research.

CHAIR FAULKNER: Are you making that as a motion?

FRANCIS “SKIP” FENNELL: I'll make that as a motion.

CHAIR FAULKNER: Is there a second? There is a second. Is there further discussion of it? Are we ready to vote on whether to retain

item 25? All in favor of the motion to delete, please raise your hands.

Those in favor of retention, please raise your hands. Okay, I guess we're gone on that.

We have eight minutes, according to my clock here. Let me ask if there's anything on the formative assessment, item 26? Susan?

SUSAN EMBRETSON: I thought that this statement originally had in it, a clause about when it's linked to states' summative assessments, that the effectiveness --

RUSSELL GERSTEN: Well, if you stick precisely to the evidence, all but one case was aligned to the state of Tennessee standards.

But this is a truncated version. It's a summary. They were valid and reliable, which most textbook formative assessments are not. So, that is a key point and I think the other point we could put in is linked to annual objectives or annual state standards, because they definitely were. They basically sampled from important annual standards.

So, I am quite happy with those two revisions.

SUSAN EMBRETSON: Yes, I would really like to add them because of --

CHAIR FAULKNER: I have never seen language, other than this.

RUSSELL GERSTEN: Again, we're only --

CHAIR FAULKNER: Do you have the language?

RUSSELL GERSTEN: I can add the language, yes.

CHAIR FAULKNER: Okay, all right. Okay, then team assisted learning strategy?

TOM LOVELESS: And just a note on that, it should be team-assisted individualization and TAI should be capitalized and it's a cooperative learning strategy.

SANDRA STOTSKY: Are we making the qualification that there were three or four other types of small groups that had no evidence?

RUSSELL GERSTEN: Well, I have a factual issue, Tom. When Ellen analyzed the data, peer-assisted learning has a significant positive

impact on student's computation. So, that also should be in there.

TOM LOVELESS: We're still discussing peer-assisted learning because we haven't agreed on the studies yet.

RUSSELL GERSTEN: Okay, but so --

TOM LOVELESS: That's based on two studies. This is based on six studies and we all agree on the inclusion of the six studies.

RUSSELL GERSTEN: Okay. So, it's a mathematical issue.

SANDRA STOTSKY: Okay, but what about the use of several other small group work approaches. Apparently, none of them, as I recall an earlier draft, led to any positive effects.

So, shouldn't we mention what you can't find working, as well as those that have a significant body of research? What I'm not clear on is how many studies lend themselves to this.

You're saying that there were only two for this, but it seems to me that we should be thinking how many studies you need before you can say you've got a solid body of evidence? This may

be a Valerie question,

TOM LOVELESS: We've already discussed that and three is the number and we have six, with TAI. There are other forms of cooperative learning that have been studied and they have non-statistically significant effects.

Now, we could add a sentence that says that, but --

SANDRA STOTSKY: Yes, I think we should be clear on which ones.

TOM LOVELESS: That opens up a can of worms, because there are a whole bunch of reasons why you --

DEBORAH BALL: There's an infinite number of things that don't have statistically significant effects and that really means that they don't have effects.

CAMILLA PERRSON BENBOW: I think if everybody could just stay for five minutes, for final comments, I think we'll wrap up this last one.

CHAIR FAULKNER: Well, I want to thank you all for working intensely today. We still

have quite a bit. What I think we're going to try to do is to convene the synthesis teams to do discussion of remaining items and to use those forums, and then I'll ask for synthesis Chairs to come back and discuss things with Camilla and me and we'll see if we can make progress that way.

We're going to have that synthesis team discussion probably late next week, probably Thursday or Friday of next week. So, we'll see what we can do.

DAVID GEARY: So, you're saying finish the executive summary by late next week. What about the rest of the --

CHAIR FAULKNER: No, I'm talking about the whole document. Yes, we will edit this. We will put together a new document by the end of this week, or at least by Saturday.

DAVID GEARY: All right.

CHAIR FAULKNER: I've already talked to Deborah about asking her to look at the Teachers portion and the Teachers recommendations and so forth. IP, if you could get me more updated recommendations and the body. I need to

have something to work with on the body. Maybe, Joan, you and I can talk about that from the documents you've got.

Camilla, if you have revisions to the body of the Assessment report, based on the material that you provided today, which I thought was very good, it would be helpful.

But I think we're going to try to put together a more complete document for you and then we'll try to map out what the synthesis teams talk about and we'll see where we go.

But we're going to still try to get this document put together by December 14th. I'd say the progress here has been much slower than I'd hoped it would be. We didn't get as far as I'd hoped we would get and I think it becomes harder to project that we will make the December 14th deadline. I heard Tyrrell moan.

MS. FLAWN: I think we can't give up on that. That is a really hard date.

CHAIR FAULKNER: It is, if we're going to have publication by the 28th of February, yes. I think if we don't make that date, we're not

going to make the 28th of February.

MS. FLAWN: That's right.

CHAIR FAULKNER: That's correct.

BERT FRISTEDT: Larry, I, for example, will have some comments on Instructional Materials (IM). Should I write immediately, send those to the IM group and to you?

CHAIR FAULKNER: Yes, you can do that. That can be true of anything in this document.

VALERIE REYNA: Just a suggestion, I think it would really facilitate things, if people have recommendations or questions that they decide how it should be phrased exactly, and send that.

If they have a change, they should actually write it up. Would that be helpful?

CHAIR FAULKNER: Yes, this is not the time to throw rocks. I can't just have random observations. If you've got changes in this document that you want to propose, then send the changes. We're passed the time for observations here.

VERN WILLIAMS: I find one problem. We voted on some things today in the report and now

for the rest of the report. You're basically saying that the Chairman of the synthesis groups are going to pretty much put the rest of the document together without any formal votes, unless we can vote via e-mail or something.

But there may be a couple of controversial items left over that we, as a Panel, need to vote on before it goes into publication.

CHAIR FAULKNER: We may and we'll just have to see if that's the way it turns out and if it does, we may have to have a conference call. I don't know what we'll do.

What I was planning to do as we got closer to the end is to see how comfortable you all were about doing a vote at the last meeting, where we would be accepting it and turning it over to the Secretary. But we don't want to go into production unless we're pretty sure about what you've got.

VERN WILLIAMS: I think there may be a couple of other issues that we --

CHAIR FAULKNER: I have no doubt that there's more to be heard.

VERN WILLIAMS: Especially technology.

CHAIR FAULKNER: So far, we have not -- I'm not sure we've had even a single point that you've said nothing on.

VALERIE REYNA: But it's good to know you care.

CHAIR FAULKNER: Yes, it is. But I think we're adjourned.

(Whereupon, the foregoing matter concluded at approximately 3:35 p.m.)