

U.S. DEPARTMENT OF EDUCATION

Race to the Top Assessment
Public Meeting on Assessment Program and
Technical Assistance Public Meeting

9:00 a.m.

Friday, June 10, 2011

Hilton Suites Oak Brook

10 Drury Lane

Crystal Room

Oak Brook, Illinois

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

2 MS. ANN WHALEN: Good morning. This is the
3 second in a series of meetings. The first one was
4 held in April and focused on local technologies. The
5 next meeting is actually already scheduled for
6 August 10th in Washington D.C., and that meeting will
7 focus on including students with disabilities and
8 English language learners in the assessment systems,
9 and we will be forthcoming with some additional
10 information on that meeting very quickly.

11 We are very privileged to be able to host
12 these series of public meetings due to a generous gift
13 from the Hewlett Foundation. So we feel very
14 privileged for this privilege and opportunity since
15 federal money very often can't be used for these
16 technical purposes. So this really allows us to be
17 transparent with our process, to get experts at the
18 table with us, and to be able to get information and
19 hear from those practitioners in the public who are
20 interested in these topics.

21 The purpose of these meetings are threefold:
22 One is to provide technical assistance to and support
23 collaborative efforts of the two consortia around
24 assessment development; second is really to expand the

1 knowledge and expertise of the Department of Education
2 and the public around key assessment issues; and the
3 third is to allow for a public venue to discuss in an
4 open and transparent way key components of the systems
5 with the consortia as well as these experts.

6 Just as a reminder, the Race to the Top
7 Program was designed to support states to deliver a
8 system of more effective and instructionally useful
9 assessments. These assessments should be more
10 accurate information about what students know and can
11 do, reflect and support good instructional practice,
12 include all students including English language
13 learners and students with disabilities from the
14 beginning, and produce data that can be used to both
15 inform teaching and learning and program improvement
16 for determinations of school effectiveness,
17 determinations to principal and teacher effectiveness,
18 as well as determinations of individual student
19 college and career readiness.

20 Additionally, as part of this program, the
21 goal of these assessments are really to be able to
22 produce one or more summative assessment components
23 that are fully implemented by every state by the
24 2014-15 school year, and, at a minimum, must cover

1 reading and language arts and mathematics in grades 3
2 through 8 and high school. These assessments need to
3 be valid, fair and reliable, cover the full range of
4 college- and career-ready content standards, elicit
5 complex demonstrations of knowledge and abilities, and
6 accurately measure high- and low-achieving students.

7 We have two grantees as part of the Race to
8 the Top Program. We have PARCC, the Partnership for
9 Assessment of Readiness of College and Careers, and
10 SMARTER Balanced Assessment Consortium, or SBAC.
11 Together these two consortia represent 45 states, plus
12 the District of Columbia.

13 For the purpose of today's meeting, we just
14 want to highlight a couple of the key technology
15 requirements that are part of these programs as well.

16 The first one is that these assessment
17 systems have to maximize the interoperability of
18 assessments across technology platforms, and the
19 second was to use technology to its maximum extent to
20 develop, administer and score assessments and report
21 assessment results.

22 So for today's meeting, we have invited a
23 range of experts to share their knowledge and
24 expertise with the consortia, with the Department, and

1 look at what is, but also what could be in the future.
2 The morning will focus on the current state-of-the-art
3 for automated scoring as well as future advances, and
4 the afternoon will focus on helping the consortia move
5 forward in implementing an automated scoring system,
6 what do they need to know to use the technology to
7 ensure valid and reliable scores and timely delivery
8 of the results in ways that it can be more useful to
9 teachers.

10 Just a quick overview of the actual way the
11 day is going to flow -- and I think everybody should
12 have a copy of the agenda -- we are going to spend a
13 little bit of time this morning giving you a short
14 overview from each of the assessment consortia about
15 their assessment design and their thoughts around
16 automated scoring. We are going to have an
17 opportunity to hear from our experts on a range of
18 issues as part of the fishbowl discussion where they
19 will present key ideas and questions, and there will
20 be an opportunity for a quick discussion.

21 We will have a 15-minute break at 10:30, and
22 then we will come back to the fishbowl and kind of
23 keep going on a little deeper with the discussion with
24 the current state-of-art, and where we need to go, and

1 some questions.

2 We will break for lunch at 12:15. For the
3 public, lunch is on your own, and I'm afraid there are
4 not many wonderful opportunities or selections for
5 food in this area. I think we have the chance for
6 people to sign up for box lunches if they haven't
7 already. You can see the table outside the door. It
8 is a very quick amount of time, 45 minutes. We
9 apologize for that.

10 We are then going to come back in the
11 afternoon and go a little deeper and talk about the
12 future state-of-the-art around automated scoring, and
13 give an opportunity for our experts to present to the
14 consortia, and to provide some questions and comments,
15 and kind of reflect on the questions we need to be
16 asking ourselves as we think about the design of these
17 assessments, and then we will take additional public
18 comment, and then wrap up for the day.

19 We are privileged to have a number of
20 experts from both within the education field, but then
21 outside of the education field, to really talk about
22 automated scoring, the current state-of-the-art, and
23 questions that we should be considering as we are
24 developing these assessments and where we need to go,

1 and in a couple of moments we will give a brief
2 introduction around the table.

3 There are two opportunities for public
4 comment, one right before lunch and one right before
5 the end of the day. The purpose of this public
6 comment is really to give an opportunity for you to
7 provide additional input, ask questions, and pose
8 additional thoughts for the consortium and the
9 Department to think about around the topic of
10 automated scoring.

11 Please, we ask that you sign up, if you
12 would like to speak, at the registration table. You
13 can sign up any time during the morning or a break if
14 you wish to speak before noon, or during lunch or
15 during the afternoon break if you wish to speak after
16 the conclusion of the second fishbowl conversation.

17 We ask that you keep your comments to about
18 three minutes per person. We are going to be actually
19 keeping track of today's conversation. So there will
20 be light up top and you will see how much time you
21 have.

22 If you don't have the opportunity to provide
23 public comment today, since we do only have these two
24 very brief windows, we also are accepting people's

1 comments, questions, and feedback through our Website
2 and our e-mail address, and that's
3 racetothetop.assessment@ed.gov, and that e-mail is
4 listed on the Website as well.

5 A couple of reminders before we jump into
6 the day: Please make sure your cell phones are on
7 vibrate or in the off position. If you have
8 particular questions or need additional clarifications
9 about the Race to the Top Assessment Program, because
10 I realize I ran through it very quickly, the design
11 requirements and goals of the program, we have
12 additional information on our Website about both the
13 program itself and the two consortia designs.

14 We also are going to be posting the
15 transcript from today's public meeting. The
16 transcript from the April public meeting is already
17 available on the Website if you would like to preview
18 that as well as the slides that were used during that
19 meeting.

20 Then as another quick reminder, the purpose
21 of today's discussion is really to promote an open
22 discussion around a wide range of topics and present a
23 number of varying viewpoints. The Department of
24 Education nor the federal government is endorsing a

1 specific viewpoint and a specific solution, and it
2 truly is to seek additional thoughts and
3 clarifications about the current state-of-the-art and
4 where we go from here.

5 So with that, I'm going to turn the day over
6 to Patrick Rooney, who is going to be helping
7 facilitate the morning discussion.

8 MR. PATRICK ROONEY: Thank you.

9 Good morning, everyone. I would like to
10 start by just having everyone do introductions from
11 the table. So we will start with Vic, down on your
12 end, and why don't you introduce yourselves and where
13 you are from.

14 MR. VIC VUCHIC: I'm Vic Vuchic. I'm
15 Program Officer of Education of the William and Flora
16 Hewlett Foundation.

17 MR. ALAN SHEINKER: Alan Sheinker, Dynamic
18 Learning Maps, GSEG Project, University of Kansas.

19 MS. JACQUI KEARNS: Jacqui Kearns for the
20 National Center State Collaborative, GSEG Project, the
21 University of Minnesota.

22 MS. JANE VANDEZANDE: Jane VandeZande,
23 Missouri Department of Elementary and Secondary
24 Education.

1 MS. SHELBI COLE: Shelbi Cole, Connecticut
2 Department of Education, representing SMARTER
3 Balanced.

4 MR. JIM PALMER: Jim Palmer, with the
5 Illinois State Board of Education, representing PARCC.

6 MR. BRIAN CLAUSER: Brian Clauser from the
7 National Board of Medical Examiners.

8 MS. JENNIFER STEGMAN: Jennifer Stegman,
9 with the Oklahoma State Department of Education,
10 representing the PARCC consortia.

11 MR. MARK SHERMUS: My name is Mark Shermus,
12 and I'm dean and professor at the University of Akron.

13 MR. DAN LONG: Dan Long, Tennessee
14 Department of Education, representing PARCC.

15 MR. KEVIN KING: Kevin King, Utah State
16 Office of Education, representing SMARTER Balanced.

17 MR. JOHN JESSE: John Jesse, Utah State
18 Office of Education, with SMARTER Balanced.

19 MR. HOWARD MITZEL: Howard Mitzel with
20 Pacific Metrics.

21 MS. DANIELLE MC NAMARA: Danielle McNamara.
22 I'm from the University of Memphis -- I'm moving to
23 Arizona -- the Institute for Intelligent Systems, and
24 the Learning Sciences Institute, and I'm one of the

1 panel experts.

2 MR. JOE BLESSING: Joe Blessing, Georgia
3 Department of Education, with PARCC.

4 MR. MOHAMED DIRIR: Mohamed Dirir,
5 Connecticut Department of Education, for SMARTER
6 Balanced.

7 MR. PATRICK ROONEY: Thank you.

8 I will point out that there is an empty
9 chair for Wes Bruce from the Indiana Department of
10 Education. He is expected at some point this morning.
11 He is not here right now.

12 So before we start with the experts giving
13 us their thoughts, I thought it would be helpful with
14 the presentation by both SMARTER Balanced and PARCC to
15 set the level for around the table and everyone in the
16 audience about what PARCC and SMARTER Balanced are
17 committed to doing as it relates to overall their
18 assessment design, but then specifically about
19 automated scoring. So they are going to spend a few
20 minutes giving us an intro.

21 MR. KEVIN KING: Good morning, everybody.
22 Again, I'm Kevin King. My specific role in the
23 SMARTER Balanced Assessment Consortium is I'm one of
24 the co-chairs for the item development work. One of

1 our work structures with the SMARTER Balanced
2 Consortium is to have a team work with representatives
3 of state office individuals across our consortium to
4 actually facilitate getting the project done, getting
5 the work done, et cetera.

6 So really, briefly, who we are, and you will
7 see something similar with PARCC, is we are a
8 composite of states throughout the country, and we
9 both have governing states and advisory states.
10 Governing states have committed through a memorandum
11 of understanding to more of a work functionality, a
12 strong commitment to administering the assessments
13 once they are completely done.

14 So feedback for our design, our theory of
15 action, the underpinnings of what we are doing, that
16 comes up individually, is we have the intention of
17 offering an integrated system, and the emphasis for
18 this integration is everything from providing
19 formative assessment tools and processes for educators
20 in the classroom through an interim assessment system,
21 and then up through the summative assessment system,
22 and you will see more of this in the next slide to
23 come, all connecting the common core state standards
24 to actually getting students college and career ready.

1 We have a strong focus on the evidence of
2 student performance, looking at evidence-centered
3 design for our full system. We are very committed to
4 having teacher involvement at every step of the way
5 from review of specifications, to input and
6 development of technology approach, to the reporting
7 systems we use, to having them involved in the
8 acceptance of items and then through the entire
9 process of acceptance of items to be used for
10 assessments.

11 We have a belief in a state-led consortium
12 with transparent governance. This is sometimes very
13 powerful, and, as you can imagine from a functional
14 sense, sometimes challenging to get all 30 of our
15 states looking and moving us in the same direction,
16 but, through it all, we attempt to be very transparent
17 with our decisions involving our consortium of states
18 in every major key decision from our consortium.

19 Again, our focus is to continuously improve
20 teaching and learning through the assessment system,
21 to provide useful information through and on multiple
22 measures. You will see more of this when we talk
23 about it a little more, and hopefully we are all
24 adhering to established professional standards for the

1 tests that we are producing.

2 So, as I said earlier, the components of our
3 system are really sandwiched between both the
4 expectation of the common core state standards,
5 ultimately in the preparation towards getting
6 students, leaving high school, being college and
7 career ready.

8 So we have three major components of this.
9 The one in the middle is where the central hub for all
10 of this is, access to formative assessment processes
11 and tools. Again, our hope here is this is not simply
12 providing a ton of tests to teachers; we don't believe
13 that is the foundation of formative assessment, but
14 actually providing the tools for professional
15 development to our educators to really connect their
16 instruction with the assessment, that it is not a
17 separate entity.

18 Related to that, we will be providing
19 interim assessments that are flexible, open and
20 provide actionable feedback. Those interim
21 assessments will be based out of the same item hold
22 that produces our summative assessment. It will be
23 run through a computer adaptive testing system and
24 hopefully be linking up to the ultimate summative

1 system. It won't be contributing to the summative
2 scores and outcomes, but it will be based out of the
3 same system, out of the same item bank.

4 Then our summative system, a benchmark for
5 college and career readiness, and I will talk a little
6 bit more about the structure of that specifically
7 related to states scoring, and how that flows into our
8 whole system, and obviously each one of these pieces
9 are connected. Again, the focus is on common core
10 assessments, using common core standards, using the
11 assessment systems, all three levels, to support
12 students leaving high school that are college and
13 career ready.

14 Many of us have seen these slides produced.
15 This really outlines sort of the timeline structure of
16 each of those components. Up at the top is the
17 discussion of using a digital clearinghouse to provide
18 these formative assessment tools and processes,
19 professional development to educators,
20 et cetera -- the green boxes -- along the way at
21 non-prescribed intervals for those interim
22 assessments. Again, these are tools for our
23 educators, but not a requirement for the summative
24 assessment, throughout the process, and then ending

1 with that summative test in the orange.

2 There are two major pieces to that summative
3 system in the orange. The one is a single-sitting
4 computer adaptive test which will be comprised of
5 three major item types: Multiple choice, constructive
6 response, and technology-enhanced items, which are
7 sort of a technical computer fusion of multiple choice
8 aspect issues and constructive response items.

9 Then preceding that, at two performance
10 opportunities throughout the year, which will
11 contribute to the overall summative score, will be
12 performance tasks. The underlying principles of the
13 performance tasks are that they will take one to two
14 class periods, roughly defined as 45 to 60 minutes
15 each -- we are still working on specifically that
16 timing -- for students to complete.

17 We envision those as not simply students
18 sitting at their desks by themselves for 120 straight
19 minutes doing a test, but really linking between group
20 involvement, group discussion, ultimately into
21 individual measures of the students and how they
22 interact with it, but truly a performance task, not
23 simply an isolated testing scenario.

24 Then for the computer adaptive version of

1 our assessment, again there is three item types.
2 These will be single sittings. We envision that all
3 three of those items, multiple choice, constructive
4 response, and technology-enhanced items, will
5 contribute to the engine and the algorithms of the
6 computer adaptive test. So students will take
7 multiple choice items, then they could see a
8 constructive response item with automated scoring,
9 which will then lead them to a technology-enhanced
10 item, and so forth, through that experience.

11 So the specific pieces for automated
12 scoring, and really to SMARTER Balanced, again, the
13 issue of timely feedback is very key, especially when
14 we are thinking of these items contributing to an
15 adaptive test. So for the summative assessment, to
16 support accountability, decision-making, and then
17 also, for the interim test as well, following that
18 same model, that we're providing those items, and
19 bringing them out of the same item bank and giving
20 that immediate feedback for the educators.

21 The thing I didn't mention earlier about the
22 interim assessment is we envision that that interim
23 assessment will be flexible in nature so that states
24 and/or educators can choose at which level those

1 interim tests will be. A teacher or the school may
2 choose to administer an interim assessment that is
3 focused on a specific set of standards or a specific
4 aspect of a language arts component, on the computer,
5 of the common core state standards, and then will be
6 able to give more direct feedback; not as an immediate
7 direct formative assessment, but as it relates to the
8 summative assessment.

9 The other piece for this, and I think I
10 mentioned this, our computer adaptive testing, our
11 focus for that is on increased precision, decreased
12 test length, decreased testing time, and more
13 immediate testing results, at least from the CAT part
14 of it. As a result, the responses need to be scored
15 during the testing session in order to contribute to a
16 selection of items after that, and with reduced time
17 comes, again, the cost savings associated from moving
18 from hand scoring to automated scoring.

19 Our timeline is very aggressive. When I
20 went into assessment, I discovered the time lines were
21 aggressive, and then we joined the SMARTER Balanced
22 Assessment Consortium, and I realized what I thought
23 was aggressive was not really aggressive. It was
24 leisurely. Our goal, and you can see in these

1 applications, is that by the school year 14-15 that
2 all components will be completed and will be able for
3 use in classrooms, and, in particular, our states have
4 signed on that they will use, that they will be
5 administering some of the assessments prior to that.

6 You can see some of the key benchmarks along
7 the way, item development, getting items ready, and
8 that's all four item types, the piloting that is
9 involved there as well as piloting the system in
10 13-14.

11 There is our contact if you need to find out
12 more information. We try to keep it as up to date as
13 possible.

14 And I think we are going to hold questions
15 for later, correct, Patrick?

16 MR. PATRICK ROONEY: Yes.

17 So I would like to then go right into the
18 PARCC presentation, which Wes was supposed to do, and
19 since he is not here, Dan is going to kick it off. I
20 think his colleague is going to help him with that.

21 Just as a reminder, if we can try to keep it
22 to five minutes, each presentation, that would be
23 good.

24 At the end, for the people in the audience,

1 there a green light, and a yellow, and a red, and that
2 means --

3 MR. DAN LONG: Time is up?

4 MR. PATRICK ROONEY: Yes.

5 MR. DAN LONG: Thank you, Patrick.

6 Dan Long, from Tennessee Department of
7 Education and PARCC, and working my colleagues in the
8 technical group, working with the organization of
9 PARCC. We certainly have a consortium of states
10 working together as an alliance to do this work. It
11 is very important to us.

12 The idea that we work together as states is
13 very important. Our work together has been most
14 importantly related to the early stages of ideas
15 around development of assessments.

16 We have 15 states that are representative
17 governing states, with other states participating, as
18 you probably can see on the map displayed here. You
19 will see the states. There are certainly some states
20 in SBAC as well. So there are some participating
21 states that are participating in both groups.

22 The idea behind our work is career and
23 college readiness as we move forward, the design of an
24 assessment system to make sure the students are on

1 track, and build pathways to college and career
2 readiness for all students is one of the most
3 important pieces of our work.

4 The idea that we can create high-quality
5 assessments, which states certainly have at this
6 point, we would like to move past that to more
7 sophisticated, authentic student performances.

8 Support in classrooms, obviously the
9 information that are available from states now and
10 from other assessments are about supporting educators
11 as we work toward helping students move toward that
12 college and career readiness goal.

13 The idea that we would be able to do that,
14 and access technology that we may have not done so
15 before, and work with innovations that are more
16 feasible based on the work that will go on from here,
17 obviously today's session is about the opportunity to
18 work with more technology that advances the work.

19 The idea that you can also have
20 accountability at all different levels, provide
21 student information, accountable to parents,
22 accountable to communities, also schools being
23 accountable within school districts, also being
24 accountable to states, up to the United States in

1 general, the idea that all that accountability be
2 wrapped around college and career readiness.

3 I have other colleagues that will be doing
4 their share of information. I will turn it over to
5 Jim Palmer.

6 MR. JIM PALMER: The plan for the assessment
7 is that there will be four assessments during the
8 school year divided relatively equally across the
9 year; 25, 50, 75 and 90 percent. The 90 percent
10 assessment would be a summative assessment composed,
11 at this time the thinking is, almost entirely of items
12 of multiple choice. There would be no open-ended
13 constructive response, although I will say that the
14 test design is still under some thought and possible
15 modification.

16 The first three would be composed primarily
17 of constructive response items, 25, 50, 75. There
18 would be some multiple-choice type items, some new
19 innovative item types in there, but the plan right now
20 is for those to be primarily constructive response
21 items.

22 The 75 percent is still being discussed as
23 something to do with along the lines of a research
24 project, a little more in-depth type constructive

1 response, possibly a little bit longer in time, and,
2 of course, the big thing is bringing technology to all
3 of these in that the results can be turned around very
4 quickly, and that's kind of where the important part
5 of automated scoring comes in, and in order to do this
6 we will need automated scoring to be a big part of it.

7 So I will turn it over to Jennifer. She
8 will continue with the presentation.

9 MS. JENNIFER STEGMAN: As Dan mentioned
10 before, technology will be central to PARCC in order
11 to provide the innovation, efficiency and
12 accessibility that's necessary for these next
13 generation assessments.

14 The technology will be used throughout the
15 development, administration, scoring and reporting.
16 Delivery will look at integrated modular systems and
17 an interoperable platform.

18 We are looking at for the administration
19 starting at Grade 6, having a hundred percent of
20 assessment online that's through course and the
21 end-of-instruction part. Both the through course and
22 the end of instruction will use technology in terms of
23 the item types. For the end of course, we are looking
24 at innovative item types along with multiple choice.

1 For the through course, providing some tools that
2 students can use in a secure environment to show their
3 knowledge.

4 Then preprogrammed accommodations for our
5 students with disabilities or our English language
6 learners.

7 And I'm going to turn it over to Joe.

8 MR. JOE BLESSING: As you see from our
9 unique design that there will be a focus and a great
10 need on automated scoring. We, obviously, need a
11 relatively quick return of information with the three
12 through courses so teachers, administrators, and
13 parents can get the information they need throughout
14 the year.

15 We will have some human scoring, obviously,
16 but the automated scoring is going to be critical
17 throughout, and, like I said, the focus, as mentioned
18 before, I think we have heavy reliance on through
19 courses as well as the summative assessment. The
20 point is to get that information back to all the
21 interested parties so that we can make a difference in
22 education throughout the year.

23 MR. DAN LONG: So our timeline, the idea is
24 that we will be developing design work at this point,

1 working as quickly as we possibly can. Our goals are
2 very much related to two years of field testing and
3 pilot testing work with 2014-2015, and the assessment
4 of the standards being set in the summer of 2015.

5 So we do have contact information and an
6 online version of that, and certainly you can reach us
7 through both Pat as well as the Department of
8 Education that serve as our fiscal agent, and our
9 program management is through the Achieve
10 organization. Thanks.

11 MR. PATRICK ROONEY: Thank you, Team PARCC.

12 Next, we would like to switch and have Mark
13 Shermus talk for a few minutes. We asked Mark to do a
14 broader overview of automated scoring in the field to
15 everyone at the table and the audience to kind of set
16 the level of where automated scoring is right now.

17 Mark is currently the dean at the University
18 of Akron, and he has written extensively on the use of
19 automated essay scoring, but he is also well-known.
20 He has done a lot of research into automated scoring
21 in general, and we thought it would be helpful for
22 everyone to have a sense of where automated scoring is
23 before we kick off the presentation.

24 We have graciously given him ten minutes to

1 talk. So he has ten minutes. Then after that we will
2 have a few minutes for everyone at the table of
3 experts and then the consortia to ask questions or to
4 raise additional points that they want.

5 MR. MARK SHERMUS: Thank you. Good morning,
6 everyone.

7 I'm going to switch formats on the
8 presentation. The slides that you have in your copies
9 are exactly the same, but I'm going to go to what is
10 the present format and see if the technology can
11 actually work.

12 I just recently came back from a
13 presentation by Dr. Mark Miller from the Gates
14 Foundation, and he said something that I think really
15 applies here, and that is that a futurist is someone
16 who explains the present for 98 percent of us who are
17 living in the past.

18 What we are going to do is actually talk a
19 little bit about some of the technology that is
20 currently available. It has been available for a
21 number of years. It is not perfect. There are a lot
22 of developmental areas that really have to be
23 accomplished, but I think you will find it pretty
24 interesting as we go through this, and I will try to

1 do this all in about ten minutes.

2 With regard to automated scoring, in this
3 context it is any technology that automatically
4 evaluates a performance assessment or a test item, and
5 it can include a whole host of item types; multiple
6 choice, constructive response, short answer, automated
7 essay scoring, symbolic, symbolic processing and
8 speech recognition. There are other item types out
9 there that can be scored automatically by machines.
10 That's what we are talking about by machine scoring.

11 With regard to automated essay scoring, it
12 is a software technology that automatically grades
13 written English. There has been work in other
14 languages as well. It can provide feedback not only
15 in English, but in other languages as well. So for
16 kids who are ELL learners, this technology can
17 actually provide them feedback in their own language.

18 It has been successfully applied to short
19 answer and longer essays of the type that you might
20 find in an electronic portfolio. It is presently a
21 Web-based performance assessment, and holistic, that
22 is a single score out of it, or you can get traits out
23 of it if you want. It can provide something known as
24 discourse analysis, which is the ability of the

1 computer to give you feedback. So it will tell you
2 that this is the theme of your essay and here are the
3 points that you are trying to make.

4 You can say: "Well, obviously the computer
5 doesn't understand the brilliance of my prose", or
6 most writers will say: "Gee, if the computer doesn't
7 understand it, how can I expect my teacher to
8 understand it?"

9 How does it work? Most grading engines use
10 rater-behavior as the ultimate criterion, and there is
11 a conversation about whether or not that is actually
12 the best criterion to use, but typically that's what
13 is used currently. The computer doesn't understand
14 what is being written; it is dumber than a brick, but
15 what it does do is it creates statistical models that
16 emulate grader behavior.

17 So if graders are saying something is good,
18 and the computer finds it, the computer will say it is
19 good. If the grader says it is bad, the computer will
20 deduct points off of it depending on the models.

21 It is possible to write a nonsensical essay
22 that gets a good score, but you have to be a good
23 writer to write bad and get a good score. You can't
24 be a poor writer and do that. It will evaluate both

1 content and writing ability. Here are some parsers or
2 engines that are heavily invested in content:
3 Intelligent Essay Assessor by Pearson, e-Rater by ETS,
4 and IntelliMetric by Vantage Learning, but content is
5 slippery.

6 So here we have the discovery of America:
7 Queen America sailed to Santa Maria with 1492 ships.
8 Her husband, King Columbus, looked to the Indian
9 explorer, Nina Pinta, to find vast wealth on the
10 beaches of Isabella, but would settle for spices from
11 the continent of Ferdinand.

12 You will notice that it has got all the
13 words there. It is called a word salad or is
14 discombobulated. You know the story that I'm trying
15 to tell, and you know that it is wrong, but most of
16 the automated testing score engines would grade that
17 as pretty much on target because I got the key words
18 and synonyms, it has good structure there, and I'm
19 going to get a good score depending on the criteria.

20 I want to mention a little bit about the
21 evaluation of shorter constructive responses because
22 that's part of this technology. These parse text to
23 determine an answer or the degree of correctness of an
24 answer, and incorporates word nets, but it is usually

1 highly dependent on the program. So several studies
2 are being conducted, one by Claudia Hickok and her
3 colleagues.

4 President Ronald Reagan, that phrase
5 generated 8,000 variants that you as a human rater
6 would recognize what the writer was trying to
7 accomplish, but the computer actually has to be
8 programmed for all of those.

9 So here is the question: What was the
10 result of the Third Punic War? Well, the correct
11 answer that we are looking for is that Rome destroyed
12 Carthage, but then you see a whole host of
13 alternatives, and those are in your slides, and then
14 you start having to worry about: "Well, what if they
15 said that Rome clobbered Carthage?" That's what a kid
16 might say. Is that going to be graded and recognized?
17 All of that has to be accounted for in the program.

18 The reliability of automated essay scoring
19 in these other technologies is pretty good. When we
20 looked at exact agreements, some of them can get as
21 high as the 80s for trained graders, and when we do it
22 in an adjacent agreement, our correlations are
23 agreement coefficients. They get in the 90 across all
24 of the vendors.

1

2 In terms of validity, it has been
3 demonstrated through a number of analyses, including
4 true score analysis, correlations with other objective
5 tests and prediction studies. All of that early work
6 has been done in the late '90s and early 2000s by Tim
7 Keith and other colleagues. These studies are coming
8 out all the time.

9 One of the key considerations in doing this
10 work or any other kind of work is the writing of a
11 prompt. Basically a good prompt is a good prompt. It
12 is no different in the human world or the automated
13 world. You want to have prompts that are focused,
14 they have a clear task and charge, and they have other
15 characteristics such as generating enough content,
16 scorability, stimulates original writing, typically
17 unemotional or unbiased. There are studies that show,
18 for example, that emotional responses or responses
19 based on some sort of emotional component are scored
20 lower by human raters than those that have a rational
21 base.

22 Reading rubrics are important. Basically,
23 they are scoring mechanisms that evaluate essays
24 holistically, analytically or via traits.

1 One thing you want to keep in mind in
2 developing any rubric, you may miss important
3 characteristics of the writing enterprise. That is if
4 you go to the writing community and you ask for a
5 definition of what good writing is, you won't get it.
6 What you will get is agreement on what is good when
7 they see it, but you won't get a clearly articulated
8 vision of what good writing is.

9 Probably one of the more popular traits is
10 the 6+1 Traits as developed by Northwest Educational
11 Research Labs. It divides the rubrics into ideas,
12 organization, voice, word choice, sentence fluency and
13 conventions. Its primary utility, however, is in
14 instruction. That is that you can get agreement on
15 vocabulary of communicating with the students as to
16 what voice is, or what sentence fluency is,
17 conventions, and the like.

18 So it is a very popular training rubric that
19 is used throughout the United States for instruction
20 and also for assessment. Most of the state rubrics
21 that are applied for high-stakes testing apply some
22 variant of this, and this is an example of what that
23 looks like.

24 With regard to the individual vendors, here

1 are some slides that show you -- and you can actually
2 get online and try these things out. There is some
3 slides that show you what they look like. Most of
4 them have an electronic portfolio component associated
5 with them. So the teacher assigns a writing prompt to
6 the class, the class types their writing prompt on the
7 computer, and then the teacher can look at the result,
8 and the student also gets feedback from the computer
9 instantaneously, and most of the instructional
10 application for this is where the teacher allows the
11 student to write multiple times until they reach some
12 minimum threshold.

13 So that is the Pearson. This is a look at
14 some of the screen shots for eRater, which is the ETS
15 product, and IntelliMetric, and you get kind of a
16 flavor, if you will, of what these slides look like.

17 In terms of developing the model, typically
18 what we do is we get a sample of about 500. We
19 randomly select about 300 of them, of the essays that
20 are graded by at least two graders. It is nicer to
21 have more. The model, it is typically a
22 multiple-regression model. It is applied where we
23 regress the writing characteristics against the
24 ratings of the raters, and we come up with a model.

1 Typically, it is cross-validated.

2 You take the remaining 200 essays and
3 cross-validate it. There is a phenomenon in social
4 science called "shrinkage" where predictions of the
5 second set of essays aren't as good when they are
6 based on the first set of essays. So adjustments are
7 made.

8 It is ideal if you have strong
9 representation at the tails of the distribution. Most
10 of these essays are rated on a rating scale of 1 to 6,
11 and it is rare to get 1's and 6's. So many of these
12 essays have ratings in the middle of the distribution.
13 You want two well-trained raters, and, again, you want
14 this cross validated.

15 With regard to portfolios, there are
16 mechanisms for storing documents. I'm not going to
17 talk a little about this, but here is the example of
18 some of the feedback that a classroom teacher might
19 get from a portfolio system.

20 The one thing I wanted to bring home is that
21 there are certain things that automated essay scoring
22 can do and certain things that it just can't get to.
23 So here is the take-home slide: It can evaluate
24 general writing ability. It can assess the degree to

1 which an essay is on topic. It can provide
2 information about the presence and degree of discourse
3 elements such as main ideas or supporting arguments.
4 It can be used in both formative and summative
5 assessment and can be incorporated in instruction. I
6 will talk a little bit more about that this afternoon.

7 Here are some things it cannot do yet: It
8 can approximate an evaluation of the correctness of an
9 answer, but it really can't determine the correctness
10 of an answer. It can't really determine if a
11 sufficient argument has been presented. It can tell
12 you that an argument has been presented, but it can't
13 tell you if it is enough, and it cannot assess whether
14 a logical conclusion has been made.

15 With regard to future directions, we have
16 some work to do in terms of the development of the
17 general writing models. There is this notion that if
18 you could define what good writing was that you could
19 come up with the gold standard and program that into
20 the computer. We can do a better job of evaluating
21 content, and we can develop a writing tutorial that
22 will provide additional feedback, and the use of voice
23 recognition for younger writers, which is something we
24 will talk about in a little bit.

1 So did I make my timing?

2 MR. PATRICK ROONEY: Almost.

3 So thank you, Mark.

4 We wanted to spend about five minutes right
5 now for others around the table to either add to the
6 points that Mark was making or ask any clarifying
7 questions that they wanted. So we will open it up to
8 anyone.

9 Do you want to start off?

10 MR. JIM PALMER: Just a couple.

11 I have seen some of the artificial
12 intelligence scores. They can make predictions about
13 how likely the score that it has assigned is, in fact,
14 an accurate score. In other words, if it gets some
15 papers that don't really fit the 500 that it has
16 looked at, it can say: Maybe I assigned the score,
17 but maybe this score isn't something it has seen
18 before.

19 MR. MARK SHERMUS: You are right. This
20 technology is really designed to do like 95 percent of
21 the writing that is out there. Believe me, folks, it
22 will not identify the next E.B. White.

23 So if you have got somebody that is
24 incredibly brilliant, very creative, and does

1 something out of the ordinary, which, by definition,
2 is not the norm, then the computer will typically flag
3 it and say: "Hey, look, I can't deal. Please have
4 somebody look this over," and that typically happens
5 operationally.

6 But, yes, there is thousands of writings
7 that it may never be able to really do a great job,
8 stylized writing, sonnets or hyperbole things. Maybe
9 someday it can, but right now it can't, but they get
10 95 percent of what we refer to as "plug-and-chug
11 writing" that it does do a very good job.

12 MR. JOHN JESSE: In a non-summative use, do
13 you think that it is realistic to project that we
14 could have AI scoring be trainable at a teacher level
15 so that, as a classroom teacher, I could write items
16 and train the engine; not just with respect to
17 writing, but other types of items? I haven't seen
18 that in the system. Do you think that that's
19 reasonable to expect that that can be possible?

20 MR. MARK SHERMUS: There are two systems
21 right now that will allow a teacher to create a prompt
22 and then have the computer score it, and I mentioned
23 in the earlier slide we were talking about the
24 development of general writing models. That's kind of

1 the direction that we are going.

2 Now, what happens is that the computer can
3 do everything except the evaluation of content. So
4 where the development has to occur is for the teacher
5 to be able to assemble the word nets and the content
6 evaluation component of it, and allow the teacher to
7 do that very quickly, without any programming skills,
8 and associate that with the prong so that they can get
9 a good evaluation of the content. So what happens
10 right now is the teacher can develop the prompt, but
11 the content is evaluated.

12 MR. JOHN JESSE: Do you think that's
13 possible?

14 MR. MARK SHERMUS: I think it is going to
15 happen.

16 MR. JOHN JESSE: Is that going to happen in
17 the next year?

18 MR. MARK SHERMUS: I would say depending on
19 where the investments are made, but the scoring
20 vendors, that could actually happen in the next five
21 years or so.

22 MR. PATRICK ROONEY: Anyone else have a
23 question or comment?

24 Alan?

1 MR. ALAN SHEINKER: I know that some of the
2 issues around essay scoring deal with too short of a
3 response and they can't be scored. So talking from a
4 perspective of students with disabilities or special
5 populations, many of these students do not generate
6 significant amount of words.

7 So if you have two sentences, and in some
8 cases one sentence, they usually get rejected,
9 rejected or unable to be scored.

10 Are we making any progress in that arena to
11 deal with that issue?

12 MR. MARK SHERMUS: I actually think that's
13 an area of development. One of the research interests
14 that I'm trying to get my grad students interested in
15 is voice recognition as the infant technology for this
16 broad-based scoring because what happens is most
17 states have keyboarding skills required in Grade 5 or
18 so, 5 or 6, and if you want to extend the technology
19 for something for the earlier grades, you have to use
20 some other kind of mechanism such as handwriting
21 recognition or voice recognition.

22 I actually think it is possible to create a
23 voice-recognition mechanism where after the student
24 sees all the words on the screen, simply by touching

1 words and moving them around can make basic editing
2 changes to it. So they don't have to have keyboarding
3 skills exactly, but they could move words around and
4 things like that.

5 So I think that's where a lot of good
6 development is, and I think it is very interesting
7 from a cognitive psychology standpoint as well, but
8 work really has to go on in that area.

9 MR. PATRICK ROONEY: Thank you, Mark, very
10 much.

11 I think we are going to move on to the next
12 presentation now.

13 Oh, I'm sorry. Danielle?

14 MS. DANIELLE MC NAMARA: I wanted to say
15 something to Alan in response to your question.

16 We are taking a slightly different approach
17 to that problem because we are building our writing
18 strategy tutoring system where we are giving feedback
19 in the sense of what kind of strategies can you use
20 when you have that characteristic of the essay. So
21 when essays have those characteristics, we give them
22 feedback on what strategies to use so that they can
23 write longer essays.

24 MR. ALAN SHEINKER: Thanks.

1 MR. PATRICK ROONEY: So moving to Danielle
2 and Howard and Brian to do their presentations, we ask
3 that they just take five or six minutes to lay out
4 some responses to questions that both Mark and SMARTER
5 Balanced presented ahead of time to help drive the
6 agenda, to really figure out where the field is and
7 where it is going, and how we can try to help push it
8 in that direction, and these are kind of key questions
9 of the direction where we are going.

10 So Howard Mitzel is going next. He is the
11 founder of Pacific Metrics, and he has got a strong
12 background. He is actually a practitioner who has
13 developed an automated scoring system which helps
14 provide a good insight into how these things look in
15 practice.

16 Howard?

17 I should also say poor Howard, he is just
18 getting over or he is still in the process of getting
19 over a cold, I think, or pneumonia happened to him,
20 but I have been assured that he is not going to infect
21 anyone around him.

22 Hopefully the volume is loud enough. If you
23 can't hear, please let us know, and we will try to
24 raise the volume.

1 MR. HOWARD MITZEL: Thank you, Patrick. I
2 was worried all week that we wouldn't have
3 microphones.

4 There are ten slides sitting behind this
5 first slide, and I can't develop everything in here,
6 but here is where I want to start. I want to start
7 with Watson. Watson was that IBM piece of technology
8 that was on Jeopardy and it just beat the pants off of
9 all these contestants.

10 If you get on IBM's Website, and David
11 Ferrucci led that effort for IBM, and listen to what
12 he says, he comes right with it, right near the
13 beginning, and he says: "We are headed toward
14 HAL 9000 or the Star Trek computer." That's where
15 they want to go, and I wanted to place that in the
16 larger context.

17 Imagine if we had that Star Trek computer in
18 our schools and the students on an individual basis
19 were able to interact with it. It would
20 revolutionize -- or I should say it will revolutionize
21 the pedagogy and the structure of our schools.

22 So what we are talking about here is natural
23 man-machine discourse, and that is a direction that we
24 should be adding, and I believe we will be adding, and

1 I hope the United States is there. I think we are
2 only 15, 20 years out from early systems that will be
3 used, but don't quote me on that.

4 So how does automated scoring fit into all
5 of this? Well, one of the biggest programs we have is
6 capturing these open responses and being able to work
7 with them. There are four basic steps in here.

8 It is hard not to morph these things, but I
9 will do the best I can: There is a recognition step.
10 We need to be able to, after we recognize it, we need
11 to be able to relate it to other data. We need to be
12 able to evaluate it. This is kind of where we are in
13 the automated scoring. The evaluation is heavily
14 statistically based for the most part. Then we need
15 to be able to respond appropriately. The automated
16 scoring systems are very simple, of course, in that
17 area. They return a number, a scoring, categorical
18 placement of a response.

19 I knew Mark was going to go before me, so I
20 tried to drive this with the kinds of questions that I
21 tend to get out there, and these questions, of course,
22 underlying them is usually certain simplifications.
23 So it works like the grammar checker in Microsoft
24 Word, this is widely believed for essay scoring, and

1 that's really all it does, and, as Mark did a very
2 nice job, we can go far beyond that. The systems that
3 we are developing are really a complex mix, and there
4 is a lot of statistical linguistic systems that are
5 built into those.

6 The second item, the second fallacy, is test
7 items have to be written specifically for automated
8 scoring. None of our items are written for automated
9 scoring at all. We process completely open. That
10 doesn't mean we can do every item, but most of them we
11 have been very successful with. We have scored over a
12 million responses now.

13 There are systems in the short constructive
14 response area that will actually need a lot of
15 constraints. The more sophisticated systems are
16 starting to use good linguistic strategies, and we
17 really are able to process fairly open systems. Now,
18 these are the major systems that are out there. There
19 is only about three or four.

20 One of the things that's coming, Mark
21 alluded to it, was what I call construction responses.
22 So we are trying to construct things like scientific
23 arguments, or compare and contrast, things like that.
24 We can't yet do that well, but if you take a look at

1 some of Kathleen Scalise's work, she has really done
2 wonderful things by showing them, if we can chop these
3 items up in a little bit, and put them into smaller
4 bites, we can go a long way, even today, with modern
5 technology, with trying to start getting there.
6 Scaffolding is very important in this. Scaffolding is
7 where you take the student and lead them along.

8 Short constructive responses cannot be
9 automatically scored, I hear this all the time. It is
10 not true. It just takes a whole different set of
11 strategies. So these are heavily recognition based,
12 and there is a lot of processing that would need to go
13 on in the front. Some of it is quite heavy
14 processing, in fact, even to the point of having to
15 define synonyms and things like that, and of course
16 linguistic strategies we are beginning to use. ETS is
17 actually doing a very good job in that area.

18 Automated scoring is facilitated by correct
19 response, and you might have noticed that Mark
20 mentioned that we can't do correct response, but short
21 constructive responses we can. So the answer, if you
22 are in an algebra test, and we do, like all of us,
23 algebra, and the correct answer is $X=5$, sure, we can
24 pick that right up, and we can score that with zero or

1 near zero error at this point.

2 Student essays cannot be scored for content,
3 Mark did a nice job in this area, and it is kind of
4 what you mean by content, looking at the 6+1
5 frameworks, which most of us implement. We can look
6 for indicators of voice, organization, flow, and,
7 again, we are weak in the evaluation of argument and
8 facets of construction such as dialectic reasoning.

9 Human scoring is always more accurate than
10 machine scoring. You have got to talk about human
11 scoring a little in the context of automated scoring.
12 Automated scoring is, because it is a dumb machine, is
13 much more consistent than human scoring, and for that
14 reason it actually outperforms human scoring in a lot
15 of situations. Human scoring has the edge where
16 interpretation is required.

17 So if a student gives you a metaphorical
18 response, if he starts out with roses are red and
19 violets are blue, we probably won't pick that up in
20 automated scoring. He probably will get a zero or
21 something, but of course a human can look through that
22 and see what is on the other side of that.

23 Human scoring is an individual behavioral
24 judgment, but what we forget is that it is also a

1 social process, and this is why human scoring has this
2 tendency -- Wes, you are supposed to be up here next
3 to me. I drew the short straw.

4 So what we are trying to pioneer is methods
5 and systems where we can blend these two together and
6 try and get the best of both worlds, get the speed,
7 the automated system, but the judgment of the human
8 scoring system, and I have more slides on that for the
9 afternoon.

10 So let me talk about hand scoring, and it
11 has a whole bunch of misconceptions, too. I'm not
12 kidding, there are people that are out there that
13 believe it is a hundred percent accurate, and it is
14 not. The error rates, the estimates I have seen are
15 in the 3 to 8 percent range.

16 Hand scoring is always more accurate than
17 machine scoring? No. If there is rater drift
18 occurring because of some of these social processes
19 that are occurring, absolutely not. Some people
20 believe rater drift is rare and when it occurs it can
21 be corrected statistically or through equating. Rater
22 drift is virtually always there in the large-scale
23 programs, and because we are starting to collect
24 responses on the computer, we have got time stamps

1 now. We can now see raters drifting on an
2 hour-to-hour basis, fascinating data, and we are
3 hoping to get time to publish it.

4 The correction to equating is really only if
5 the drift is systematically layered. A lot of the
6 drift is just random because it is individual. So I
7 am using drift in a very general term, by the way, a
8 very general way. Some people just use it as a bias
9 in one direction or another, but I'm using it more
10 generally.

11 Agreement rates are akin to a reliability
12 coefficient? No, no, no, in terms of their scores,
13 which means there are error in them. The other thing
14 you see when you start to really look at these
15 agreement rates is they tend to be inflated, and there
16 is a statistical argument we have why that occurs.

17 I think I only have five more seconds.

18 Hand scoring should always be the gold
19 standard? Well, it is the standard, and it is all we
20 have got. So whether it is the gold standard or not,
21 I'm not sure.

22 I'm going to save this slide for the
23 afternoon. I always get asked: "How does this thing
24 work? What does it really look like?" So here is a

1 flow chart of the system that we use that actually
2 combines hand scoring, and I will try to get back to
3 it this afternoon.

4 Special populations, we are just starting.
5 The large scale use of automated scoring for testing
6 in the United States is only just beginning. So we
7 have a lot to learn. There is limited research thus
8 far. That Bridgeman article is an ETS publication.
9 It is, I believe, NCA 2009. You can look that up. It
10 is easy to find on the Web.

11 Pacific Metrics' single study showed no
12 effect relative to hand-scoring distributions. We did
13 300 subject studies. I'm not comfortable with the
14 size, but we saw absolutely stable results so far.

15 Students with disabilities, there is current
16 research underway. I am not an expert in this area,
17 but across four states of ETS, we are working with an
18 ETS grant on this, and ETS is also very active in this
19 area.

20 The fact that we didn't find any
21 differences, we are going to. There is no question in
22 my mind. Different language groups, idioms, things
23 like that, we might have to learn to pick those up and
24 work with them. We are struggling a little bit with

1 texting systems right now. You know, the kids: "Are
2 you there?", R, U, and we have to learn and see if we
3 can recognize those.

4 As we consider accessibility in
5 technology-delivered assessment, we will need to
6 consider student responses/scoring as well as
7 delivery. So we have an awful lot of work to do on
8 both sides there.

9 That's the presentation. Thank you.

10 MR. PATRICK ROONEY: Thanks, Howard.

11 So I appreciate that presentation.

12 We want to just take maybe three minutes.
13 If anyone has any clarifying questions they want to
14 ask Howard? We will have a longer time after the
15 break this morning to get into a lot of the meat of
16 the presentation, but if anyone has any simple
17 clarifications or observations they want to make
18 before we start.

19 Jennifer?

20 MS. JENNIFER STEGMAN: Howard, you talked
21 about the reliability of hand scoring in that rater
22 reliability is not really a determination of that, and
23 then you also talked about the machine scoring and how
24 it is more consistent. Would you say the same thing

1 about machine scoring and the reliability as you did
2 the hand scoring?

3 MR. HOWARD MITZEL: I'm trying to remember
4 Jennifer's question. I didn't mention error
5 reliability rates, but I did talk about agreement
6 rates, which I sort of used as a substitute for that.

7 The crazy thing about automated scoring is
8 it is perfectly reliable. So you put the same
9 response through the machine and you get exactly the
10 same thing out every time.

11 So reliability of machine is not at issue.
12 What we do is we compare it to human scoring, and you
13 can start to establish what its reliabilities are.

14 Does that answer your question?

15 MS. JENNIFER STEGMAN: Well, I heard someone
16 mention before talking about multiple choice: Every
17 time you score a multiple-choice document, you are
18 going to get the same thing out. So even though on
19 your automated scoring, when you put that through, you
20 get the same thing out. Is there still reliability
21 issues that you need to be concerned about, I guess,
22 was my question.

23 MR. HOWARD MITZEL: It is accuracy issues
24 that we are concerned about, more so than reliability.

1 That's where we are going. That's our brass ring that
2 we are still reaching for.

3 MR. PATRICK ROONEY: Anyone else with
4 questions, write your questions down, please. We want
5 to make sure we don't forget them.

6 Moving along now, the next person that is
7 going to speak is Brian Clauser. Brian is with the
8 National Board of Medical Examiners, which one of our
9 intentions was it try to get people a little bit
10 outside the traditional K-12 sphere, as well as people
11 inside the K-12 sphere, to see how other people might
12 be tackling this issue.

13 So the National Board of Medical Examiners
14 has an assessment that includes automated scoring, and
15 I think it actually focuses on short responses from
16 the people who take the test, which I think could be
17 of relevance to hear about his experiences.

18 So Brian?

19 MR. BRIAN CLAUSER: Thank you. I want to
20 spend a few minutes first describing how we use
21 automated scoring in the United States medical
22 licensing examination and then hit just a little bit
23 on what we have learned from it.

24 First of all, right now we are using

1 automated scoring operationally on computer-based case
2 simulations. These have been operational as part of
3 one of the licensing examinations since 1999. We also
4 have a separate simulation which the examinees
5 interact with simulated patients and write a patient
6 note. We are currently scoring those using expert
7 raters, but we have a research project right now to
8 see if we can score them using automated scoring
9 systems, and the initial results have been very
10 positive. I would be happy to talk more about that
11 later.

12 What I want to say about both of these is
13 that they are entirely based on scoring content.
14 There is no interest in form of what is being put
15 down. It is just content driven.

16 The computer-based case simulations provide
17 what we think is an unprompted and dynamic simulation
18 of the patient care environment. It is dynamic in the
19 sense that the simulated patient changes based both on
20 the underlying problem and what the examinee does in
21 terms of actions. Each examinee completes nine of
22 these simulations as part of the examination and they
23 have 25 minutes for each simulation.

24 This gives you a sense of what a simulation

1 looks like. Each of the tasks begins with a brief
2 opening scenario, and you probably can't read this
3 one, but it says that a 65-year-old man is brought to
4 the emergency room complaining of chest pains. So you
5 have to figure out what to do with this fellow. The
6 icons at the top allow you to collect history or
7 physical examination information; to order tests,
8 treatments, consultations; to advance the case through
9 simulated time or a change in location.

10 As I said, the primary thing we are doing
11 here is using free-text entry, and it is entirely
12 content driven, although, unlike most essays, we do
13 have something of a constrained vocabulary. There are
14 about 2,500 unique actions that somebody can do and
15 about 13,000 ways the system will recognize those
16 actions. So, again, you can't quite read that, but it
17 says EKG, CXR, and the system will recognize "EKG" is
18 electrocardiogram and "CXR" is chest x-ray, and so on,
19 and the examinee has to confirm that that is what is
20 meant, but the system recognizes these things so they
21 can enter them with free text.

22 Once they have made their orders, they,
23 again, advance the case through simulated time using
24 this, and, again, this interface allows them to

1 advance the case a minute or a year, or anything in
2 between, or when the next test result is available.

3 So in scoring these simulations now with a
4 regression-based scoring system, we have been doing
5 that for coming up on 11 years, and with very good
6 results, very positive outcomes in that regard, very
7 much like the systems you heard about this morning;
8 however, correlations with expert raters are about .9
9 for these individual tasks.

10 The system is highly efficient. We have
11 scored 300,000-plus examinations, which is several
12 million tasks during that time. It would have
13 basically been impossible for us to run this as part
14 of the test were it not for the automated scoring
15 system. The 100,000 hours of expert time would be
16 training physicians to do this, and that's with only
17 one rating per case. If we wanted two, it would have
18 doubled that. It just would not have been practical
19 logistically to pull this off, being able to not only
20 pay for it, but deliver the scores in a rapid manner.

21 One of the other positive things about the
22 regression system that we have used, and I will argue
23 the other side later on, but at least right now one of
24 the positive things is that the regression-based

1 system doesn't require the experts to be too explicit
2 about their rating policies. So they don't need to do
3 the ratings. They don't need to actually know what
4 they think is good performance. They need to be able
5 to explain it. They need to know, but they don't need
6 to be able to explain what is good performance or bad
7 performance, and I think this is relevant to the
8 essays as well.

9 Now, having described that and said what I
10 think are the positive outcomes, I want to mention
11 that all of this comes at a fairly high price in a
12 number of respects.

13 First of all, emphasize the cost of doing
14 this. The test development group that develops these
15 simulations is about as large as our test development
16 group that develops the multiple-choice questions that
17 are on the same examination. It is a two-day
18 examination, with a day-and-a-half of multiple choice
19 items and a half day of simulations.

20 So basically in terms of development
21 expenses, with are talking 3-to-1 per hour of testing
22 to develop these things, and those expenses also work
23 their way out because the quality control steps and so
24 forth are much more intensive for this sort of a

1 format.

2 The second potential price here is
3 complexity. We have had lots of difficulties having
4 these systems interact with the test drivers that
5 deliver computerized examinations. The fail rates
6 during are higher because when you have a complex
7 piece of software it is more difficult to use.

8 The third price that I think is important to
9 us, and I'm not sure how important it is in the K-12
10 context, is the security issue. We deliver our tests
11 all year long, which means the materials are reused,
12 and these items are largely memorable. So security
13 issues increase in the way that don't with
14 multiple-choice items. With multiple-choice items, if
15 you write enough of them, you have very large pools,
16 and they are not that memorable. So security is a
17 bigger problem with this.

18 The fourth potential price is associated
19 with novelty. I think people don't like
20 multiple-choice items because there is nothing novel
21 or innovative about them, and familiarity breeds
22 content, but familiarity also does away with a lot of
23 construct irrelevant barriers because everybody has to
24 answer multiple-choice questions.

1 So this is a graph showing the scores across
2 the nine simulations for a large population of
3 examinees, and the point is this information was
4 collected and the test had been up and running for six
5 years probably. So it wasn't new. It is a
6 high-stakes test. People have plenty of reason to
7 want to prepare for it. We provide materials to allow
8 people to practice doing the simulation on their own
9 before the test.

10 The simulations are administered to the
11 examinees in random order. So the two of us might
12 have exactly the same form, but we won't see those
13 individual tasks in the same order. So there is
14 really no task effect here that is simply position
15 effect, and it is a nine-point scale, and I don't know
16 if you can read the scale up there, but it goes from
17 something well under 5 to well above 5.5 in terms of
18 the score range by position, and that suggests to me
19 that there are real issues with people learning to use
20 the simulation format during the testing day.

21 I mean, it is unreasonable to believe that
22 their ability to manage patients has changed during
23 the test in the afternoon. So it has to be learning
24 to use the simulation.

1 If you have people doing something very
2 simple like grading an essay, most of that is likely
3 to go away, but to the extent that your interface for
4 word processing is different than the one they are
5 used to or whatever else, it is an important
6 consideration that I think we need to keep in mind.

7 The final potential price on my list is
8 reliability. The difference in reliability for these
9 very large items and multiple-choice items per unit of
10 time is just gigantic, and we are able to take
11 advantage of the fact that we can require people to
12 come and sit down and test for 16 hours and carve out
13 one test. So we can be generous and say: "You have
14 got half a day to do simulation." Even that half a
15 day of doing simulations would not produce a
16 stand-alone score that we could use. The reliability
17 would be way too low.

18 So you are giving something up when you take
19 testing time and use it for these higher-fidelity
20 simulations, and it is just something to bear in mind.

21 Thank you.

22 MR. PATRICK ROONEY: Thank you, Brian.

23 We will take four or five minutes now for
24 anyone who has any clarifying questions they want to

1 ask. Again, these are just clarifications of some of
2 the points Brian made, and we will definitely have a
3 chance to ask more in-depth questions from his points
4 later.

5 Wes, do you want to start off?

6 MR. WES BRUCE: Sure.

7 Could you talk a little bit about how you
8 train or establish the scoring ability of your engine?

9 MR. BRIAN CLAUSER: Sure, and I plan to
10 discuss this in some more detail this afternoon, but
11 basically what we do is that we have content experts
12 create a rough sort of key, which says these are good
13 things to do in the case, these are bad things to do
14 in the case, these are really bad things to do in the
15 case; and then the system we use right now, which is a
16 regression-based system, you simply take these
17 categories, you add up how many things that people
18 did, and those are independent measures in the
19 regression equation.

20 We get good content experts to rate those
21 performances so they can see what somebody did, and
22 the time frame in which they did it, and they give it
23 a rating on this 1 to 9 scale, and we simply produce
24 weights based on that regression equation, what they

1 did to the score you would have expected them to get.

2 MR. WES BRUCE: Thank you.

3 MR. DAN LONG: You mentioned the idea of
4 returning scores in a rapid way. What kind of time
5 frame is typical that someone would get their scores
6 back from this type of system?

7 MR. BRIAN CLAUSER: I'm going to tell you
8 when they do get their scores back and when they could
9 get the scores back.

10 When they do get their scores back is
11 several weeks later. When they could get their scores
12 back would be when they finish testing. It is
13 delivered on the computer. It could be scored, except
14 the people who tested, the very initial block, the
15 first couple of weeks, there is a resource file that
16 is sent out. Except for those people, it could be
17 scored on the fly.

18 We made a policy decision not to do that
19 because there is not a gigantic pressure to get those
20 scores immediately, and it gives us that extra quality
21 control step to make sure that there was no problem.

22 People get very upset if you say "You passed
23 your license examination" and then we discover later
24 that there was a problem. So having a couple of weeks

1 to make sure that everything is fine works well for
2 us.

3 MR. DAN LONG: You said you are making a
4 distinction between scoring and actually reporting and
5 a policy decision delay between those.

6 Should a policy decision be another
7 direction, if you felt that the scoring and reporting
8 could take place at the same time, would that be
9 possible within the system that you have?

10 MR. BRIAN CLAUSER: Possible certainly.
11 Exactly what changes would have to be made in our test
12 driver, I'm not sure, but we have been discussing
13 lately the possibility of doing on-the-fly scoring for
14 security purposes to terminate tests, for example, if
15 we see that somebody is not taking the test seriously
16 and other things like that. So the potential is there
17 to do this very quickly.

18 MR. PATRICK ROONEY: Okay. Thank you,
19 Brian.

20 We will go to the last presentation. Last,
21 but certainly not least, Danielle McNamara. As she
22 mentioned, she has been with the University of
23 Memphis, but next week she is going to be with the
24 University of Arizona, and she, I think, will tell you

1 more about her experience as she is going through her
2 presentation, but she spent a lot of time looking at
3 natural language processing and latent semantic
4 analysis, and looking at it not in a capable summative
5 way, but more in a capable formative way, how you can
6 use that in the classroom for instruction, how that
7 piece fits in.

8 So Danielle?

9 MS. DANIELLE MC NAMARA: Good morning.

10 So to contextualize what I do, one of the
11 things that I focus on is building tutoring systems
12 and focusing on strategy instruction primarily for
13 adolescents, and I have been charged to talk about
14 natural language processing and latent semantic
15 analysis, and we use that on the back end of the
16 systems. After they have been trained to use these
17 strategies, we have them practice them, and then we
18 give them formative feedback on how well they are
19 doing.

20 So natural language processing, just what is
21 it? You have gotten some good pictures of what it is.
22 It is basically, very basically, analyses of
23 languages, language that is produced by humans, and we
24 use various statistical techniques and various sources

1 of information that are in language. This can be the
2 words that they are using, the syntax, the semantics,
3 the key words, and various statistical techniques.

4 I'm going to talk more, very specifically,
5 about LSA in a minute, but it could be data mining,
6 human and machine learning. So there are many
7 different ways of using that natural language
8 processing.

9 Why do we do it? There are many different
10 reasons to do it, but I could divide them into two
11 different purposes. One is to understand language in
12 the purpose of theory, so I define that as cognitive
13 science; and then the other is to respond to the
14 speaker or writer appropriately, more along the lines
15 of artificial intelligence.

16 I speak mainly in the context of Coh-Metrix,
17 which is a tool that we have built for national
18 language processing which analyzes texts on many
19 different dimensions of cohesion and language. We
20 have a couple of tools that provide about 60 majors.
21 We have an internal tool that provides many more.
22 Some are useful and some are not.

23 The way the tool works is that it does
24 pre-processing, syntactic analysis and lexical

1 analysis, meaning it analyzes the words, and then we
2 use databases that have been developed by many
3 different groups that provide information on words
4 such as CELEX, MRC, word lists and word net, and also
5 LSA that I will talk about. We use this information
6 that is already out there. So there has been a lot of
7 work across the last 10, 20, 30 years that allows us
8 to put all of this information together such that one
9 tool provides a large amount of information.

10 Then we have written algorithms that provide
11 information on language that aligns with theory of
12 discourse such as word information, sentence
13 information, and then something most people don't
14 consider, which we specialize in, which is cohesion,
15 which is the overlap between conceptual entities in
16 the language.

17 We have done many different corpus studies
18 using Coh-Metrix so that we can understand language,
19 and understand text, and understand differences
20 between different types of text. So we have done
21 analysis, for example, to look at differences between
22 narrative text and expository text, differences
23 between the first chapter and the last chapter,
24 differences between an abstract and an introduction.

1 Deception, we can tell if somebody is lying. We
2 examine differences between candidates in various
3 political races, and we have also looked at features
4 of writing. So, for example, we focus very much on
5 differences between first-language writers and
6 second-language writers.

7 So, for example, just to get into some
8 specifics that are somewhat relevant here, one thing
9 we found is that L1, which are first-language writers,
10 is characterized, when we just look at linguistics,
11 they use more different words. So that's lexical
12 diversity. They have more complex syntax, as you
13 might imagine, and they use more infrequent words,
14 that is rare words. So we call this sophisticated
15 writing. So better writers are more sophisticated
16 writers, which is not a big surprise.

17 We have also found that higher-quality,
18 second-language writers, that is second-language
19 writers who are writing better, are very similar, that
20 is they have greater lexical diversity and they use
21 more rare words, but they are also different in many
22 ways. They use more less familiar words, and less
23 familiar words is a different indicator that has to do
24 with speech, that is words that we find in spoken

1 dialogue. They use less meaningful words, and they
2 also use greater syntactic diversity that has to do
3 with whether or not they are using the same tense over
4 and over and over or if they are using different
5 tenses as they go along.

6 We have also examined differences between
7 first-language writers and second-language writers.
8 So in my study, for example, we have found that
9 first-language writers use more specific words; they
10 have greater cohesion; they use more motion verbs;
11 they use more rare words; they use words with more
12 senses; they use more given information; and they
13 have, again, more rare words.

14 The bottom line here is not to understand
15 all these variables explicitly, but to say that there
16 are quite a few differences linguistically between
17 first-language writers and second-language writers.

18 So, again, one tool that we are using in
19 Coh-Metrix is latent semantic analysis, and latent
20 semantic analysis also underlies many of the tutoring
21 systems that we use as well.

22 So what is latent semantic analysis, it is a
23 statistical technique that uses singular value
24 decomposition, which the purpose of LSA is to educate

1 semantic overlap, which means two sets of words or
2 text, and that can be two sets of words, just a word.
3 It can be sentences. It can be paragraphs or it can
4 be entire text.

5 So if you can picture this like this, you
6 have two texts, and then you also have a semantic
7 space. So what you do when you are using LSA is you
8 construct a semantic space.

9 Largely, what depends, the quality of your
10 analyses in LSA depends on the quality of your LSA
11 space. So here you have your LSA space. In LSA you
12 calculate a term document matrix. There are many
13 alternatives to LSA, many alternatives that are being
14 developed. Some do term-term. Some do
15 document-document. So there are many variations on
16 this. What a term is is a word, very simply. A
17 document can be anything. It can be a paragraph. It
18 can be a text. What this is is a word, and then it is
19 a 1 or a 0. So these are just 1 and 0 matrices, very
20 sparse matrices, that are constructed.

21 So what you do is you decompose these
22 matrices into vector matrices, and then what this does
23 is this gives you, in the end, after you decompose
24 these matrices and directives, this gives you

1 information, and you can calculate the cosigns between
2 those sets of text or those words.

3 So here is some LSA examples. So, for
4 example, the cosign between doctor and doctor is one.
5 That's a good thing. Then the cosign between doctor
6 and surgeon is .7, and that's high. Sugar and
7 sucrose, .69. Depend and independent, .24.

8 So one of the things that is very important
9 is that LSA does not depend on word overlap, but it
10 depends on whether or not the words occur in the same
11 situation, that is in the same documents. So words
12 that occur in the same sentences may have very low
13 cosigns, but words that occur in the same documents
14 will have very high cosigns. So "house" and "home",
15 even though they don't occur in the same sentence, are
16 going to have a high cosign because they occur in very
17 similar documents.

18 So here we show that by "Doctors operating
19 on patients," zero key words, but "Physicians do
20 surgery," the LSA .80. "The radius of spheres" and "A
21 circle's diameter," key words 0, LSA is .55. "The
22 radius of spheres" and "The music of spheres" -- I
23 don't know what that means, but it sounds nice -- key
24 words 1, and the LSA is .01. So you see the overlap

1 as being very high for the LSA than very low.

2 Here is a way of conceptualizing LSA because
3 it places words in a space that is a cosign when you
4 think of how far is a word from another word or a
5 sentence is from another word, and here you see LSA
6 using a statistical technique that places them in
7 space. So you can see it placed the words in that
8 space, and that is I'm following the assumption that
9 LSA provides a model of conceptual knowledge, that our
10 understanding of the word world can be found in how we
11 speak and what we say, but that doesn't speak very
12 well to its practical uses and limitations.

13 So we think about LSA in terms of a
14 theoretical tool, but we also use it as a practical
15 tool. It has very high success in many tasks. It has
16 been used for essay grading, choosing multiple-choice
17 answers, grading answers to questions, corpus studies.
18 Again, it depends very highly on the words and the
19 space relative to the text. If the words are not in
20 the space, then it is not very reliable.

21 It is somewhat dependent on text size. It
22 depends on how you use it, however one of the things
23 that I am very sensitive to is that it only assesses
24 one level of the semantic relationship. Very often in

1 assessment what we are looking for are different
2 levels of relationships. So one needs to be cognizant
3 of that.

4 There are many advances and alternatives to
5 LSA. So the field is growing immensely, and very
6 rapidly, and we are growing in our ability to better
7 assess semantic relationships. My approach in using
8 LSA is to never ever use it alone. So I tend to use
9 it in combination with other approaches.

10 MR. PATRICK ROONEY: Thank you, Danielle.

11 So we will take about two minutes if anyone
12 has any clarifying questions they want to ask, and
13 then to the break. So for those of you that are
14 asking any questions, you are holding up our break.

15 MR. WES BRUCE: Thanks, Patrick.

16 This isn't a clarifying question; it is an
17 education question, and I'm probably going to ask you
18 to do the impossible: Can you please explain to me
19 what's the core difference between natural language
20 processing and latent semantic analysis without me
21 having to take six graduate classes?

22 MS. DANIELLE MC NAMARA: I will say that
23 latent semantic analysis is one type of natural
24 language processing. There is not a difference. It

1 is one approach to natural language processing that
2 does not rely on any syntactic processing, any
3 pre-processing. So some people have called it kind of
4 a dumb method.

5 Essentially, you could use LSA any time,
6 anywhere. So it is a freestanding method, which
7 really opened up the field ten years ago or
8 fifteen -- I'm sorry, I'm getting old, twenty years
9 ago. So there you go.

10 MR. WES BRUCE: That's it.

11 MR. PATRICK ROONEY: Anyone else? I
12 actually have one clarifying question, Danielle: You
13 talked about the database that you built for
14 Coh-Matrix, and it sounded like you populated with
15 existing, I don't know, pieces of evidence where that
16 could go into it to help you build that model because
17 it relies on the words in the space in order to be
18 able to score.

19 So it sounds like there are a lot of
20 activities that are out there that you could use. So
21 you don't necessarily need to start from scratch; is
22 that right?

23 MS. DANIELLE MC NAMARA: Well, we are
24 conflating two things. One is the information, the

1 word-based information that we use in Coh-Matrix, is
2 information about words like their hypernyms,
3 polysemy, and associations, and various information,
4 largely human based. So people have collected by
5 connecting experiments.

6 In terms of LSA, there are many different
7 parameters in LSA that we can vary. One of the
8 parameters is simply what is the corpus that you use
9 to construct the LSA space.

10 Now, in Coh-Matrix, we did some experiments,
11 and we stick to one corpus, but we have also looked at
12 what does it mean to use, for example, a Wikipedia
13 corpus, which is immense, and we would have to use a
14 super computer to analyze it, and we would have to
15 break down analyses into steps, and it takes months to
16 create versus using smaller spaces; and then my
17 colleague -- or ex-colleague -- Chang-Liang Liu is
18 doing a lot of work on semantic spaces and how to
19 isolate into a semantic space, but this is work that
20 surrounds Coh-Matrix and isn't really inside that
21 tool. So they are two kind of separate notions.

22 We also can vary how many dimensions we use,
23 and in other projects we use the vectors instead of
24 the cosigns.

1 MR. PATRICK ROONEY: Well, thank you,
2 Danielle.

3 So we are going to take a quick break for
4 about ten minutes, actually, to try to get us back on
5 schedule. So the bathrooms are out in the big room.
6 I think there is close bathrooms there.

7 When we come back, we will go into
8 discussion and public comments.

9 One last comment to you in the audience:
10 This is your opportunity to sign up to makes comments
11 before lunch. So please don't stampede the table, but
12 there is a table out there where you can sign up and
13 give your comments or feedback to the people at the
14 table.

15 Thank you.

16 (Recess taken.)

17 MR. PATRICK ROONEY: Okay. Thank you,
18 everyone. We are going to go ahead and pick back up.

19 I want to thank all the presenters this
20 morning for giving us their background, their ideas on
21 automated scoring that's being used in different
22 places, and things that it can and it can't do. I
23 think that was very helpful. I will be honest: It
24 was a little over my head, but that's my problem, not

1 anyone's problem, but I learned a lot from all of you.

2 The next hour, the goal is to go a little
3 more in-depth with some of the ideas that the
4 presenters presented, and to try to push on some of
5 the ideas and see how both PARCC and SMARTER Balanced
6 can learn from that.

7 I think PARCC and SMARTER Balanced has
8 certainly risen to the challenge of creating ambitious
9 plans. Automated scoring sounds like a case where it
10 can be used to try to accomplish some of their goals,
11 and without using automated scoring, it is really hard
12 to do that.

13 So I don't know if anyone has any initial
14 questions to start off?

15 Jim?

16 MR. JIM PALMER: Actually, I have four
17 points. I won't cover them all initially. I will try
18 to wait for others to speak.

19 I wanted to know what is the state of
20 handwriting recognition, and especially with younger
21 children? I don't know who wants to try and take that
22 up.

23 MR. HOWARD MITZEL: I will start. The
24 Russians have been quite advanced in this area. It is

1 very interesting. The postal service is using it.
2 Notice, though, if you are reading an address off of
3 an envelope, that is a very constrained kind of
4 system.

5 One other technical point: If you are able
6 to actually trace the writing, the construction of a
7 letter, your recognition goes way up. If you're
8 taking, basically, like a photograph on a page and
9 trying to read it, it is very difficult in the kinds
10 of essays that students write. That's because their
11 loops are coming down, crossing the line below, and
12 things like that. Recognition rate is, maybe, 80, 85
13 percent at best. If you make them write on every
14 other line, that's better.

15 We didn't believe that that level was good
16 enough to support further research into the area, and
17 we are not currently working on it.

18 MR. MARK SHERMUS: Just a couple of things.

19 First of all, kids' handwriting has changed
20 over time. The best handwriting recognition is
21 actually with the block writing, and as kids forget
22 how to do cursive writing, and all they do is block,
23 that, actually, in terms of recognition is going up.

24 On high-scale testing, we have got thousands

1 and thousands of essays, but what you probably do is
2 scan the essay as written for the younger grades, and
3 then ship them off to India or Ireland where they
4 actually transcribe the essays and they will ship them
5 back. That's actually a very cost-effective way to do
6 it and reasonably insensitive way to do that if that's
7 what you want to do.

8 I actually think, as I mentioned before,
9 that the high payoff is going to be with voice
10 recognition systems where they are now at almost 99.7
11 percent accurate. I mean, if you haven't played with
12 Microsoft Office on that for a while -- it used to be
13 kludgy, and you had to do a lot of training and all
14 that good stuff -- now it is a five-minute training
15 session and you get pretty good results.

16 The trick is, once the essay is dictated,
17 then to be able to do some basic editing for the
18 younger kids, and those systems I haven't seen yet,
19 but I don't think they would be all that expensive to
20 develop.

21 MR. JIM PALMER: But it would seem like the
22 turnaround time on something like that would be
23 longer.

24 MR. MARK SHERMUS: Are you talking about the

1 transcribed?

2 MR. JIM PALMER: Yes.

3 MR. MARK SHERMUS: Well, they have armies in
4 Ireland and India standing by to take your money and
5 do that transcription.

6 MR. JIM PALMER: And what about in regards
7 to spelling? I mean, at some point you say you will
8 transcribe it, but then you also have to understand
9 what is being presented, what is being conveyed.

10 I have been in validation meetings where
11 there are eight of us at the table, and one of us is
12 able to figure out what that word was actually saying.

13 MR. MARK SHERMUS: Typically, the
14 instructions for the transcribers is to call it and
15 type it as they see it, and if the word is misspelled,
16 then the word is misspelled. If you, as a human
17 rater, can pick that up and make some sense of it,
18 then maybe you will reward it. If you can't, then
19 maybe you will penalize it. It really depends on what
20 rubric is for the evaluation.

21 So this is like one of the things that
22 happens with automated essay scoring. In some states,
23 the use of non-standard English, the rubric actually
24 instructs the raters to discount that, that is not to

1 take it into consideration, try to make some sense of
2 it and reward the idea. The problem for these states
3 is that no matter how well they train the raters, they
4 just can't do it.

5 So this is actually one potential advantage
6 for automated scoring is that if you could isolate
7 what components are associated with non-standard
8 English, and if that's your rubric, you actually
9 instruct the computer to do something that a human
10 rater cannot.

11 MR. JOHN JESSE: So our discussion is
12 focused a lot on language, and I would like to move it
13 back to mathematics. We know that you can score a
14 finite answer, $X=7$, $X=12$, but where are we at to give
15 a student a complex mathematical problem that might
16 produce a series of calculations such that the final
17 answer is just part of the overall scoring, but the
18 process would be of particular interest and
19 importance, and it wouldn't be a finite solution set?
20 What could our expectation be to have automatic or
21 have the artificial intelligence be able to handle
22 that type of a problem in a manner that would be
23 consistent with summative assessment?

24 MR. HOWARD MITZEL: Actually, I wish

1 Kathleen Scalise was here to answer that, but I will
2 give it a try.

3 In math, if we are having students write
4 equations, it almost sounds like you are heading
5 toward a tool where students would work interactively
6 with a computer potentially to solve equations.

7 So we are playing with these things, but
8 they need to be integrated into probably steps as we
9 go for the student, with interaction in each
10 direction, and with evaluation at each step also.

11 MR. JOHN JESSE: A scoring decision?

12 MR. HOWARD MITZEL: Yes. These interfaces
13 are not as bad as people think they are that need to
14 be written. You know, there is a couple of programs
15 out there now, and you can construct an interface that
16 will do a very good job interpreting those.

17 MS. DANIELLE MC NAMARA: My understanding is
18 systems developed by Carnegie-Mellon do much of that,
19 though the students type in the algorithms. Now, they
20 are constrained by their theory of the paradigm. I
21 can imagine developing a system very easily to do what
22 you are saying.

23 The only thing that really constrains a
24 system is whether or not they can type it in, and in

1 math, I used to do some work in strategies in math,
2 and that is fairly well-constrained, and you can
3 identify what strategies and what processes they are
4 using, and it is not very hard to identify them. It
5 takes research, and it takes some time to develop
6 them, but essentially if a human can identify it, then
7 you can develop an algorithm to do it.

8 MR. PATRICK ROONEY: Mohamed?

9 MR. MOHAMED DIRIR: I have a question for
10 the presenters, but before I do that, I just want to
11 share that the State of California has trained SPST.
12 California, the largest student population, has given
13 this directional path of SPST. Now, the focus of that
14 and the philosophy is somewhat different.

15 So I'm wondering how the scoring systems,
16 artificial intelligence scoring systems, would work
17 with these different types of assessments.

18 MR. PATRICK ROONEY: So, Mohamed, I think
19 your question is whether there is any sort of
20 difference or concerns about trying to use automated
21 scoring for a computer adaptive test versus just a
22 computer base form, essentially, test?

23 MR. MOHAMED DIRIR: Yes. How would the
24 scoring, assessment scoring or constructive scoring,

1 work with adaptive processing or adaptive
2 administration of the test versus how it will work
3 with computer-based tests where you have a set of
4 items, set of five items, five items per student, and
5 how that difference will affect the scoring.

6 MR. PATRICK ROONEY: Great. This is a good
7 chance to jump in and say to the experts that I would
8 certainly encourage you to respond to any and all of
9 these questions, but if any of the people at the table
10 or if anyone has anything they want to add from their
11 experience working on assessment systems, feel free to
12 add it in at this point, or any point, too.

13 MR. MARK SHERMUS: I will try to give it a
14 shot. Typically, with computerized interactive
15 testing, you have a large item bank, and you are
16 drawing from items that are in a reasonable ability
17 range of the student. Automated essay scoring,
18 typically the largest number of essays that you would
19 give in any one testing situation would be one,
20 possibly two, because it really does take a bit of
21 time to do that assessment.

22 You, however, do bring up a really important
23 point, I think, and that is that we have sort of the
24 assumption that each essay prompt is approximately

1 equal, and we know empirically that that's not the
2 case. So that the same principles that apply to the
3 difficulty levels of, say, essays are similar to what
4 you might see in an item bank for multiple choice, for
5 example, computerized adaptive tests.

6 So in Florida, what they did is, for
7 example, in writing, they used to -- they don't do
8 this anymore -- but they used to have the multiple
9 choice writing assessment, and then they would give
10 the essay prompt, and to do the equating from year to
11 year, they would use anchor items from the writing
12 prompt to calibrate the difficulty level of the essay
13 prompt -- I'm sorry, they would use the multiple
14 choice from the writing multiple-choice portion to
15 calibrate the difficulty level of the writing prompt,
16 and the conundrum is that the correlation between the
17 multiple choice writing assessment and the essay
18 prompt was .6, and the correlation between the reading
19 assessment on the FCAP and on the writing assessment
20 multiple-choice portion of the test is .8.

21 So there was some known effects taking
22 place, and one could reasonably argue that there was
23 maybe a G-factor that was being assessed, but to get
24 back to your original question, some work is going to

1 have to be done about estimating the difficulty level
2 of the different writing prompts so that if you are
3 trying to equate from one year to the next, you have a
4 mechanism to do that.

5 MR. BRIAN CLAUSER: The only thing I would
6 add is that there is a lot of work that has to go on
7 in terms of developing the test specific scoring
8 algorithms, and, of course, that has to all be done up
9 front if you are doing something that is not in any
10 way adapted, and you can imagine assessments that
11 would have lots of things that are scored with an
12 automated scoring system. They could be short answers
13 that were only a sentence or so.

14 So you could think about adapting something
15 in that way. It is just where you have to do the
16 work, whereas otherwise it is possible to release
17 these prompts, use them in the tests, and then
18 developing the scoring algorithms afterwards.
19 Clearly, if you are going to do anything adaptive, you
20 have to go the other way around, and that opens up
21 issues with security, and so forth, that you wouldn't
22 have otherwise.

23 MS. DANIELLE MC NAMARA: I would speak again
24 from the point of view of developing a tutoring system

1 where, in fact, the accuracy of the algorithms from
2 the students' point of view, it is much more
3 forgiving. So if you have an algorithm that pushes
4 them, they have written an essay, and you can point
5 them to what they can do to improve the essay, the
6 fact is that they can improve it in many different
7 ways.

8 So if you give them feedback on the essay,
9 they are generally quite forgiving in terms of whether
10 or not you absolutely are accurate on that feedback
11 and on your assessment, and this also has to do with
12 the fact that quite often there is great variation in
13 how the teachers grade those essays as well. So they
14 have learned to be able to be forgiving and to make
15 inferences about the quality of the essay.

16 By contrast, when you are giving high-stakes
17 feedback, it is not forgiving.

18 MS. ANN WHALEN: So when we talk about the
19 different arc of development, the design and kind of
20 the solution for automated scoring, I have heard a
21 couple of different things from Howard and Mark about
22 the timeline, and also Danielle about the timeline,
23 that these things can be produced, or, secondarily,
24 when in the actual design cycle they need to be

1 running.

2 Can you guys just go into a little more
3 detail around that, and go from the beginning, how far
4 along the rubrics have to be developed, and,
5 realistically, what we are talking about with
6 developing these different algorithms or kind of
7 spaces to create these solutions?

8 MR. HOWARD MITZEL: I'm not going to quite
9 answer your question, but I'm going to respond.

10 The question about integrating automated
11 scoring in the adaptive mode is actually on the cusp,
12 if you are actually going to try and get one. We need
13 to start doing some very practical things with this.

14 So one approach is -- and I'm getting to the
15 infrastructure question in a second -- one approach,
16 for example, is actually not to score it, the
17 students' constructive response. You just use the
18 multiple choice, and then when a student is given a
19 final score, at that point you have the scoring, and
20 you integrate it there.

21 If you want to use automated scoring under
22 an additional paradigm, and this is where we get into
23 real infrastructure issues, and you probably want to
24 go to stage adaptive testing, that would probably work

1 quite a bit better because it gets down into how the
2 unit works, you download the packets, and you want to
3 be able to download fixed packets in staged systems.

4 So we have to know what direction you are
5 going to go in. These become very complex systems,
6 especially around adaptive, and the designs have to be
7 out there. I am guessing two years, I believe. I
8 will be happy to see other people's estimates.
9 Perhaps a year.

10 MR. PATRICK ROONEY: So I have some follow
11 up, Howard. When you talk about staged adaptive
12 testing, can you expand on what that would mean?

13 MR. HOWARD MITZEL: I will try. Very
14 simply, it is almost like a Novell's test. So the
15 adapter or the test is take a normal test. It
16 operates at three levels. Now, take it and chop it
17 into nine pieces. Take three tests and chop it into
18 nine pieces, and depending upon how a student does on
19 that first stage, then they would get either an easier
20 or a more medium. So the items come in test slots or
21 packets, and it is kind of like a Lovell's test where
22 you are feeding in the next set of items.

23 MR. BRIAN CLAUSER: I would suggest looking
24 at a test like the CPA licensing exam, probably one of

1 the most innovative exams. It comes in three parts.
2 There is the multiple-choice system, there is a
3 performance assessment, and then there is a writing
4 assessment, and what they do is they sort of integrate
5 all of these three things into a series of tests that
6 CPAs have to take.

7 So there is a multiple-choice component that
8 covers your basic knowledge about what it is, various
9 knowledge components of being a CPA, but the
10 performance assessments are things that CPAs would
11 actually do.

12 So what they do is they give them a
13 spreadsheet, they give them a case study, and then
14 they go ahead and use the spreadsheet to solve some
15 problems, just like any CPA would do; and because the
16 CPA is required to communicate very effectively with
17 his or her clients, they give them a writing
18 assessment, and they have separate scores for each
19 section of the test, and there are multiple sections,
20 maybe four sections of the CPA.

21 The way they do this is they start with what
22 Howard referred to as a routing module where the
23 routing module comes in at sort of a medium level of
24 difficulty, and you calibrate this depending on what

1 your needs are, and then it would route a person to
2 their higher level set of assessments or a lower level
3 set of assessments. How many you would need would
4 probably be a function of the kind of levels of
5 efficiency that you are looking to have.

6 So it is a staged, multi-purpose test, and
7 it is probably one of the better ones that I have
8 seen. It is used for licensing, but it could also be
9 used for a K through 12 kind of situation as a model.

10 MR. JIM PALMER: Where AI scoring is being
11 used now in a high-stakes K through 12 environment, I
12 think Louisiana uses something that is AI scoring now,
13 but I don't know of any other settings where that is
14 going on.

15 MR. HOWARD MITZEL: Louisiana does an end of
16 course. It has English, math, biology, all three. I
17 think it is about six subjects that are all
18 automatically scored.

19 MR. JIM PALMER: And what kind of questions
20 are being used where AI is being used?

21 MR. HOWARD MITZEL: The items are not in any
22 way designed for automatic scoring. The items are
23 developed by a vendor that doesn't know anything about
24 automated scoring in some cases.

1 MS. ANN WHALEN: Are they multiple-choice
2 automated response?

3 MR. HOWARD MITZEL: It is multiple choice.
4 I think out of 40 points, it is probably two
5 constructive response items, maybe three.

6 MR. JIM PALMER: So I guess what I am more
7 interested in is you, I believe, Pacific Metrics, does
8 the scoring for those; is that correct?

9 MR. HOWARD MITZEL: Yes, but I wasn't
10 advertising that.

11 MR. JIM PALMER: And those are not, I don't
12 believe, essay types. So I think someone said math.
13 So it is more content driven.

14 So what is kind of the process that you have
15 to go through in preparing to score those on your end?

16 MR. HOWARD MITZEL: As I mentioned before,
17 it is not as bad as you think. You have to write an
18 interface. The student is required to operate with
19 some rule set. You can give them an interface or you
20 can give them a set of rules in which to do it, and we
21 love using a calculator as a tool.

22 So the student can enter in all these
23 symbols and parentheses, and things like that, and
24 create an equation for math.

1 MR. MARK SHERMUS: And a number of states
2 have experimented with it. Indiana, they use Pearson,
3 and I think was teaching to use the CBT model, and
4 their reports were generally positive. They use it in
5 a way that is appropriate, and that is as a second
6 reader for right now, and the reports that were
7 written up on it were generally fair.

8 MR. JOHN JESSE: So, Jim, in Utah, we
9 administer our state-wide writing assessment and
10 electronically score it with AI, with a persuasive
11 prompt, and we have just completed our second year
12 with that, transferred from paper hand scored to
13 machine scored. Very successful, I would suggest, and
14 very few bumps in the road.

15 I have a question about equipment. One of
16 the big discussion points right now is as states and
17 districts and schools are buying technology and moving
18 towards the future, iPad devices have become very
19 popular in the school, and lots of technology dollars
20 are being spent on those.

21 Does AI scoring make that transfer to using
22 those devices currently? Right now I'm not aware of
23 any system, current delivery system, that can use
24 those, that are certified for those, but does AI

1 scoring create a greater roadblock to using those, or
2 is the technology neutral, or would they enhance our
3 ability, potentially, because it varies in entry
4 ability? Can you address that? I'm just curious
5 about your perspective on devices.

6 MR. MARK SHERMUS: Well, in terms of
7 devices, all of them use a Web interface. Any device
8 that can take advantage of a Web interface can work.
9 So if you have an iPad or a smartphone, you can enter
10 into most vendors' interfaces. That's really not a
11 problem.

12 You know, whether you like to type on a
13 glass screen or not is something that you might want
14 to think about, but when you look at kids today, they
15 are there on their little smartphones with their
16 thumbs, and they are actually faster with their thumbs
17 than they are with using the keyboard approach with
18 their fingers.

19 So I think that's an interesting component,
20 but there are really no, from a testing point, there
21 are no really big inhibitors to using that.

22 Now, some of the vendors in their electronic
23 portfolio systems use add-ons that require you to have
24 certain levels of Javascript and things like that, and

1 I can imagine that there might be some issues with
2 that; but for the basic entry of text, whether they
3 are doing it with their thumbs or on a glass keyboard
4 or whatever, it is pretty transparent.

5 Most kids, this, to me, is actually the most
6 adaptive thing you can do. You just give a kid the
7 tool that he or she is most comfortable with in
8 composing their text and let them go. You don't force
9 them to use a modality that they are really not
10 comfortable with.

11 MR. JOE BLESSING: Yes. Brian has mentioned
12 that some of the medical students did better as the
13 test progressed, and I think he was assuming that it
14 was the ability to access the tool, and I think we see
15 that with device type of interactive questions.

16 What can be done to make sure that our
17 students aren't being penalized for not knowing what
18 the device is or is doing? Can they practice ahead of
19 time, et cetera, et cetera?

20 MR. BRIAN CLAUSER: Well, we are probably
21 going to address this more this afternoon, but I think
22 picking up on what Danielle was saying, it is
23 integrating that with instruction. They are doing it
24 every day, and their perception is it is not really a

1 high-stakes test, it is just another assignment, and
2 then it becomes part of the curriculum. That
3 integration really hits the NCLB goal of making this
4 part of what you do, and it has a whole bunch of other
5 advantages that you can log in as well.

6 So I think the integration instruction, if
7 they are just doing it as a part of what they normally
8 do, and you just happen to be taking samples of that
9 as their performance, then we don't have the situation
10 where teachers are prepping their kids in the two
11 months prior to that screening, testing. They are
12 just teaching, and they are using the technology as
13 part of the teaching enterprise.

14 MS. DANIELLE MC NAMARA: Just to echo that
15 the training environment should mimic the testing
16 environment as much as possible, unless you are
17 testing transfer, and that, yes, you should have
18 practice tests.

19 MS. JENNIFER STEGMAN: Brian talked about
20 the price of the complex simulations and complex
21 formats, and talked about how there would be increased
22 cost in some of the areas.

23 Will we see some cost efficiencies also with
24 AI scoring, and can you talk a little bit about like

1 will the costs maybe be more at the beginning, but
2 then see efficiencies toward the end on what we can
3 expect in terms of cost for these items?

4 MR. HOWARD MITZEL: I didn't bring it with
5 me, but there was a good article written by -- help me
6 out here -- that Stanford group?

7 I will have to look it up for you, but he
8 talks about these cost productions. There is one
9 company that I think for essay scoring, for example,
10 charges like around 3 bucks a head now for each
11 transaction, and that can go down to a quarter,
12 probably, easily. So the answer is, yes, huge cost
13 savings.

14 MR. PATRICK ROONEY: So I would like to
15 follow up on that in taking Jennifer's point that you
16 have to build the system so it knows the key words in
17 them and what it is going to score it for. Does that
18 \$3 per person take into account the up-front building
19 of the system to score the essay?

20 MR. HOWARD MITZEL: Mark, you may know more
21 about this business end than I actually do, but I
22 believe these prices are set relative to what hand
23 scoring costs now rather than what it costs to market
24 the automated product.

1 MS. DANIELLE MC NAMARA: I can talk a little
2 bit about what the costs might be. The up-front costs
3 are in the timeline. The timeline is a direct
4 function of the amount of money you spend, and how
5 much money you put into it, and also the players.

6 So a small-time shop means that: "Not one
7 of the big-time players wanted to play with me. So I
8 had to develop my own corpora and that took a lot of
9 time." So you reduce the time by having people who
10 have large corpora, and the degree to which you have
11 that reduces the cost.

12 So you have an up-front cost of developing
13 the system. Once you have developed it, that cost is
14 gone, but then you have to keep up the system. The
15 cost there is on servers, and those who maintain the
16 servers, and those who answer questions to the users
17 and who fix the system when it breaks.

18 So you get rid of the cost of the scorers
19 and people who would answer the questions about the
20 scoring, but you add the cost of the servers and the
21 maintenance of that.

22 I think the cost is a little bit less for
23 the maintenance of servers than for somebody who
24 answers questions when the system is down, and that's

1 a direct function of how good the system is, of
2 course.

3 So each direction has costs. Clearly, the
4 cost of building an AI system is currently higher. As
5 time goes by, over the past ten years, for example,
6 the time spent to develop the system and the money it
7 costs has been dropping radically.

8 So because of the tools that have been
9 developing, so people who have been around a long
10 time, everybody has been developing these utilities.
11 So every time you build a system, you have to shop
12 around for new utilities because every year the whole
13 field has changed.

14 MR. MARK SHERMUS: I take a more cynical
15 approach on this. I have been a taxpayer for over 45
16 years, and nothing ever gets cheap, but what happens
17 is stuff gets better.

18 If there are two major consortia working
19 together, and we are testing on common core standards,
20 and we can share assessments or sections of
21 assessments across states, that's where the real cost
22 savings are.

23 I'm a technical advisor on a committee in
24 Florida, and I can tell you they spend millions of

1 dollars each year developing and scoring their
2 assessments, as does every other state in the union,
3 and they are all different tests. They all have
4 different components, but they are all measuring
5 approximately the same thing, but the common core
6 standards that you should be measuring are the same
7 thing across the entire country.

8 The consortia will measure that by getting
9 cost savings so that not each state is spending
10 millions and millions of dollars, but that those costs
11 will be amortized, and that's where the real savings
12 is going to be, but take those savings and invest it
13 in better, more authentic tests because these
14 development issues that everybody is mentioning are
15 still out there.

16 The money has to be invested, for example,
17 on automated essay scoring, at least the three things
18 I was talking about, the assessment content and the
19 degree of correctness that we have, the sufficiency of
20 scientific arguments, and those kinds of issues that
21 really are going to require investment in technology
22 and in the development along those lines.

23 MR. PATRICK ROONEY: Actually, I think
24 Mohamed had a question, but just briefly, when you

1 talk about investment, and I think you talked about
2 this in the beginning, getting to the point of where
3 you are scoring for the argument that a student makes,
4 what do we need to get there?

5 Is this just a question of we need to
6 develop the technology that can try to do it, does it
7 now exist and need to be improved, or is it something
8 that is 15 years out? Where is the field headed and
9 how long is it going to take to get there?

10 MR. MARK SHERMUS: I think there is some
11 sort of highbred things that you could do right now to
12 get going right off the bat. I think to get to the
13 point where you are talking about, I think it is
14 anywhere from three to ten years depending on how much
15 is invested and what areas you want to cover because,
16 like in scientific writing, there is a lot of great
17 work going on, and word nets, and some of the
18 sophistication is pretty much in place, and I know
19 some of the vendors have actually been working on this
20 for some time.

21 But, to start off, you can do some sort of
22 highbred kind of thing where if you are asking about
23 content, you can ask the student to write an essay,
24 and then put bullet points for the content that you

1 want to make sure they have covered, and you use
2 automated essay scoring to evaluate the writing
3 component and the short-answer technology to score the
4 bullet points, and at some point what the vendors will
5 be able to do is actually combine the short-answer
6 technology with the automated essay scoring, but they
7 are going to need some time to do that.

8 The marketplace has asked for one or the
9 other and not really a combination of the two. So
10 they are going to need some development time to put
11 that together. You can do sort of a short essay,
12 followed by bullet points, and that probably could be
13 scored pretty reliably and pretty correctly very
14 shortly, if not right now.

15 MR. PATRICK ROONEY: I'm sorry, the same
16 question for Danielle and Brian.

17 MR. BRIAN CLAUSER: The thing I will say
18 about how long will it take until we score the quality
19 of an argument, for example, there is a certain sense
20 there that what is holding us back is not the computer
21 technology to do that. It is the experts don't know
22 what makes a good argument.

23 Any time the experts can satisfactorily
24 articulate what it is that they are using as their

1 criteria, the computer will very rapidly be able to do
2 it better than they can; more accurately, more
3 cheaply, more reliably, but if they say: "I will know
4 it when I see it," then that makes the work more
5 difficult.

6 MR. PATRICK ROONEY: Danielle?

7 MS. DANIELLE MC NAMARA: Brian just stole my
8 answer. But I have a graph that shows it this
9 afternoon. So there.

10 So I have been working on this problem for
11 the last two years, and I have a little of a glim
12 answer to it, but we are getting better and better as
13 we go along, and I will talk about exactly that
14 problem, that the issue is a direct function of the
15 degree to which both the student is making inferences
16 or adding to the essay with their own prior knowledge,
17 with their own experiences that go outside the domain
18 of the essay, and the degree to which the rater is
19 also making inference and going outside the essay.

20 The degree to which you can't predict that
21 and the degree to which the rater is not even aware or
22 can't express it, and the raters do not agree with one
23 another, makes this problem very hard.

24 MR. PATRICK ROONEY: Mohamed?

1 MR. MOHAMED DIRIR: Sorry. Actually,
2 Mr. Clauser answered the question I was going to ask.
3 It is about the reliability and accuracy of these
4 scores.

5 If we use human scorers to justify the
6 effectiveness of this cost, we will have
7 coast-to-coast scoring and coast-to-coast results from
8 these essays, and they will all be different. If you
9 have the same tests, and they are scored the same way,
10 you can repeat that process of assessment.

11 In creating the artificial intelligence
12 scoring, you need to ensure they are scored all the
13 same. You set that this word is correct, this is
14 correct, and so on and so forth.

15 I think the reliability tips for the goal of
16 artificial intelligence scoring, I think.

17 MR. MARK SHERMUS: In terms of the
18 sophistication of artificial intelligence, it is
19 getting pretty good.

20 I mentioned earlier the conversation with
21 Mark Miller from the Gates Foundation, and he told a
22 story that I think is apropos here.

23 He was sitting at dinner with his wife, and
24 they got a phone call from the credit card company

1 asking his wife if she had lost her credit card or it
2 has been stolen. How many have you had that kind of
3 call? A few of you had those kind of calls.

4 She said, no, she thought she had it, but
5 they asked her to please check her purse just to make
6 sure, and she went to check the purse, and, lo and
7 behold, the card was not there. It was not there.

8 So immediately she said: "Well, how did you
9 know this? I mean, how did you know this?" What they
10 said is that she gone to a gas station that she had
11 never gone to before, and that's sort of a one-shot
12 deal. Then the next thing was she said: "Okay. I
13 could have randomly gone to any gas station. I could
14 have run out of gas anywhere in the city." What else?
15 What was the key thing?

16 Then they said: "Well, the amount of gas
17 that you bought was radically different than you had
18 ever bought before." They had an SUV, buying
19 25 gallons of gas, and all of a sudden there was a
20 very small purchase.

21 So the point here is that this stuff is
22 getting pretty good, and we just need to develop the
23 kinds of algorithms that can pick up on the
24 sufficiency of the arguments, but it is getting pretty

1 good. Commercially, it is working.

2 American Express, when they call you, it is
3 going to have the ability of informing you something
4 has gone wrong, either somebody has run off with your
5 credit card number or the like, to the point where
6 most people have to call their credit card companies
7 before they go overseas so that they don't have a
8 problem.

9 So it is getting good. It is not perfect,
10 but it is getting a lot better.

11 MR. WES BRUCE: Well, I would say I have
12 one, but I have several. So I want to push. So I
13 will just go ahead and take my shot, and lay them all
14 out here, and see who answers.

15 I want to push a little bit on the cost
16 issue to make sure that I understand or that we
17 understand the variable.

18 So I'm just going to lay out a scenario
19 where I'm testing math students to write essays in
20 every grade from 3 to 11. I'm going to ask those
21 students to do four types of writing. It is possible,
22 you know, I have a narrative, I have got a persuasive,
23 but the prompts are going to spiral, and there are
24 going to be multiple new prompts every year. So I'm

1 not going to reuse. I will use the prompt one time
2 and I'm going to discard it.

3 The point of where my question is going is I
4 want to try to understand, I want to extract a
5 mathematical formula where what I have put together is
6 an engine to score that stuff costs so much, and then
7 there is some costs associated with, I believe, each
8 type of writing, perhaps scoring it -- I could be
9 wrong -- and then there is some costs associated with
10 each individual piece of writing.

11 So that's sort of one piece where we talk
12 about costs, and I'm just trying to understand, sort
13 of from a formula view, where is the big cost, where
14 are those little recurring costs, and then, obviously,
15 there is some maintenance and some engine has to crank
16 stuff through.

17 The other thing that I want to push on a
18 little bit are are there -- let me just put it this
19 way: What are the current limitations on item types
20 that scoring models, that the current existing scoring
21 models, place on them?

22 And I know Howard talked about they would
23 love to use a calculator as an entry device. So that
24 seems to be a limitation that being able to do

1 automated scoring places on that.

2 So in the early days, when we talked down
3 this path in Indiana, and tried to construct
4 short-answer items in a couple of content areas, we
5 lived by some constraints that we believed made the
6 items easier or more appropriate for
7 automated -- artificial intelligence in those
8 days -- scoring.

9 So I want to make sure that we understand
10 what, if any, limitations there are. I mean, I was
11 struck by Brian's talk about scenarios, and about the
12 fact that they are about 3-for-1. They are spending
13 about three times the resources to get the set of
14 scenarios that they want.

15 So have at it.

16 MR. BRIAN CLAUSER: I can comment a little
17 bit on the costs, and I think that what I have to say
18 is pretty straightforward.

19 Developing the original system is going to
20 be the single most expensive thing to do, but if you
21 spent a million dollars developing a system that over
22 years tests 20 million students, that's 5 cents a
23 student. So if you are going to use it for a long
24 time, and use it for a lot of people, it gets to be

1 really cheap, even though it is a really big expense.

2 For us, developing the individual test level
3 algorithms has turned out to be fairly expensive, and
4 we have put a lot of effort into trying to find more
5 efficient ways of doing that, but, again, it is
6 entirely a function of how many people are going to
7 see each test. So if you are developing an algorithm
8 for a specific essay, if you are going to have tens or
9 hundreds or thousands of students taking it, then it
10 gets to be pretty inexpensive.

11 In the long run, at least for us, one of the
12 serious expenses also is the one that Mark brought up
13 before, which is that once you get sucked into doing
14 this sort of work, you become obsessed with doing it
15 better, and that means that you are constantly
16 investing in new approaches for doing it.

17 I will talk a little bit this afternoon
18 about the fact that we have been using this
19 regression-based scoring for 11 years, and during that
20 time looking at it, poking it, and doing a lot of
21 research over the last few years, and probably next
22 year we are going to completely replace that whole
23 approach to scoring with a new approach that we think
24 is better. That was a lot of expensive staff time

1 doing the work on it.

2 MR. MARK SHERMUS: How many of you are
3 associated with state testing programs? How many? A
4 few.

5 So what proportion of the budget actually
6 goes for the development of items? There is a chunk
7 of change that goes with that, but you are spending
8 most of your money doing equating studies, you are
9 looking at differential impacts and the whole bit, and
10 that's where, I think, after you get that initial
11 system, as Brian was mentioning, after you get that
12 initial system up, you are going to want to do it
13 better.

14 You are going to want to make sure that
15 certain kids in certain populations aren't being
16 negatively impacted or more negatively impacted than
17 they would be with a paper-and-pencil assessment. You
18 are going to spend money on that. You are going to
19 spend money on equating. All the kinds of things you
20 are spending money on now are not going to change
21 automated scoring. That component is still probably
22 going to be in place. Again, I think the big payoff
23 is going to be the efficiency across the two
24 consortia. You are going to get a lot out of that.

1 MR. JOHN JESSE: Would you use the same
2 engine for sixth-grade writing as you would with the
3 content, let's say, of a response to a science
4 question? So it is just different coding issues?

5 Can we think of, in terms of the summative
6 assessment, language arts and math, develop one AI
7 engine, and then we will tweak it again and add
8 components that would use other pieces, or would we
9 have to develop several different engines depending on
10 the type? What would be your projection on that?

11 MR. MARK SHERMUS: That really is a great
12 question because we really haven't had a comparison
13 across the different automated scoring engines right
14 now. There hasn't been a comprehensive comparison
15 across it.

16 What happens is when you look at the
17 individual research reports, they all have similar
18 kinds of results, although their mechanisms are
19 slightly different. So some will tell you they will
20 pick up more content than others. Some will tell you
21 that they are really more focused on general writing
22 ability than others, but when you look at the
23 reliability and validity studies, they all come in
24 pretty much the same, but we haven't had the

1 comprehensive evaluation.

2 What I do is I liken it to antidepressants:
3 You look at antidepressants, and the recovery rate on
4 antidepressants across the board is about 70 percent,
5 across the board, even though the mechanisms of action
6 are quite different from one drug to the next. You
7 still get this recovery rate of about 70 percent.

8 So what you may find is that certain kinds
9 of engines do a better job in particular situations
10 and that other engines do better when you are looking
11 for something else.

12 I don't think we have done enough work to
13 conclusively say: "Here is the right model that's out
14 there, and all you have to do is tweak it for a
15 different genre of writing or a different age level of
16 writing."

17 MS. DANIELLE MC NAMARA: There is a factor
18 in essay writing as to whether or not you are using
19 corpus based versus corpus independent scoring, and I
20 have been playing a lot with corpus independent
21 scoring which allows you to not have to redo the
22 scoring system for each prompt. It has been fairly
23 unsuccessful. It is certainly not high-stakes ready.

24 We have made progress, even since the day I

1 wrote this talk, that is the progress is really quick.
2 We have come up with ways of improving it.

3 Corpus based means that you have to collect
4 essays and score them by hand to have benchmarks. The
5 difference between what you are talking about when you
6 have science writing, the probability that you need to
7 have a corpus-based scoring system decreases because
8 scientific writing is more constrained. The answer is
9 more constrained. The reason that persuasive writing
10 is so hard, that is the content and the quality of the
11 content is so hard to score, is because the accuracy
12 of whether or not the answer is correct is so wide.
13 With scientific writing, there is an answer, and the
14 quality of the writing is fairly well-constrained.

15 So the likelihood of building corpus
16 independent algorithms to assess scientific writing is
17 very high, very high, and very fairly medium for
18 persuasive writing as yet, and this speaks to the
19 engine. It is not the engine that matters. It is
20 what goes into the algorithms.

21 MR. PATRICK ROONEY: Does anyone have
22 anything they want to add to that response? We have
23 about three minutes left.

24 MR. JIM PALMER: I just wanted to add

1 something to what Howard said about human scoring, and
2 one of the things that started to concern me, what I
3 have started to take a look at, is some of the things
4 that happen during the actual scoring period,
5 everything that we do; we have the scoring directors,
6 and we have paper readers, and they are reading behind
7 papers, and they are giving examples to scorers to try
8 and hone their skills, but we are not really actually
9 sure if they are actually helping the scoring or not
10 because the scoring is occurring in such a quick time,
11 and there is no way what's going on makes sense, but
12 I'm not actually sure that we have a way of evaluating
13 that what we are doing is improving the overall
14 reliability of the scoring.

15 I don't know, Howard, if you can comment on
16 that or not, but that kind of piqued my interest
17 lately in the last couple of years, that we think we
18 are doing the right thing, but maybe we are not doing
19 the right thing, all the work that we are doing during
20 that actual scoring period.

21 MR. HOWARD MITZEL: Despite the way that
22 some of my earlier comments may sound, I think
23 actually the quality of hand scoring is quite good in
24 the United States right now. There are three or four

1 major vendors, and they are doing about as good a job
2 as we could expect. Now, I know that doesn't answer
3 your question.

4 We are able to start, and we have a lot of
5 work on this, a lot of initial work, where we are
6 trying to integrate the automated scoring with the
7 hand-scoring process, and it is working very nicely.
8 We are able to create an interaction between them.

9 In terms of the accuracy of hand scoring and
10 all of the organization that goes around it in the
11 vendors, in the end it is really kind of a test,
12 re-test reliability. I mean, if we keep scoring that
13 same essay, what is that reliability as it goes along?
14 It is an answerable question, but of course the
15 designs quickly become too large. You can't have 50
16 raters scoring 50 different essays on 50,000 kids. So
17 the volume becomes too large.

18 We are getting there. We are going to start
19 using this technology, this new technology, to
20 actually assist with hand scoring.

21 MR. JIM PALMER: Okay. Thank you, Howard.

22 MR. PATRICK ROONEY: So that concludes our
23 time for the morning session.

24 We did leave some time for public comments.

1 We had several people sign up. I think we have five
2 individuals. So just a reminder that you have three
3 minutes. There is a little timer on the left-hand
4 side here, with the green, yellow, red. It will go
5 yellow when you have one-minute left and then red
6 where we will ask you to stop.

7 If you have additional comments beyond the
8 five minutes or there is someone not on this list that
9 wants to provide comments, you can provide them to us
10 at racetothetop.assessment@ed.gov.

11 Doug Stern will go first, followed by Ken
12 Leason, and then David Williamson, Max McGee, and then
13 Joe Dixon.

14 So Doug Stern?

15 MR. DOUG STERN: I will try to keep this
16 brief.

17 Looking at the whole program, we are trying
18 to do more than just summative assessment, that sits
19 out there alone distorting the instructional
20 curriculum, and integrate it with other measures.

21 So one question I have is the scoring we are
22 talking about is looking just at the end product. The
23 kids have been working for a long period of time on an
24 essay, the steam is rising off their head, and all of

1 that has been thrown away because all we are looking
2 at is the end results here.

3 So are there measures to integrate the final
4 essay? You know, I heard scaffolding mentioned, but
5 with various tools so that you are measuring not just
6 what the student finally produces, but how they get
7 there so that you can inform instruction.

8 I guess that is my question, how are we
9 going to do more than just the summative essay
10 grading.

11 MR. PATRICK ROONEY: Thank you.

12 And just as a reminder, we are not actually
13 responding to the comments now, but these are good
14 questions that I think all of us in our roles can
15 think about as we go forward.

16 So the next is Ken Williamson.

17 MR. KEN WILLIAMSON: I'm the Executive
18 Director of the National Council of Teachers of
19 English, and it has been very instructive to learn
20 more today about the progress that you are making.

21 I guess normally I would come to an event
22 like this and say this is the section of time where
23 questions actually become bombastic speeches. I'm not
24 going to do that to you today. So I guess you can be

1 relieved.

2 I guess what I would like to say is this:

3 It seems to me that, if you look over the last decade,
4 during the decade of No Child Left Behind, that really
5 gave rise, I think, to the Race to the Top grants to
6 have more sophisticated tests that could test a wider
7 range of learning.

8 The suspicion of so many teachers during
9 this time is that there has been homogenization that
10 has been driven by the relative inflexibility of the
11 tests that have been in use. So we start with a
12 confidence problem among educators about testing, and
13 it seems to me that it would be very advantageous soon
14 in your development process to start to involve really
15 effective teachers; not just in field testing, but in
16 conceptual questions of design so that the concern
17 that the next generation of tests will simply narrow
18 the range of materials tested, teachers can be
19 reassured that that's not what is going to happen.

20 I think right now, even this morning, as we
21 hear about the problems with syntactic variation and
22 argumentation, argumentation is absolutely at the top
23 of the priorities for sophisticated teaching. We
24 don't want to be in a position where six traits

1 becomes the default writing modality because it is
2 easier to test, and this is at the heart of the
3 concern of many teachers.

4 So if we could have a more robust dialogue
5 now, while things are still in the development stage,
6 I think it will only result in better tests in
7 2014-2015. So thank you.

8 MR. PATRICK ROONEY: Thank you.

9 David Williamson. I think no relation.

10 MR. DAVID WILLIAMSON: Those of you who know
11 me know I talk a lot. So even though it is atypical
12 for my style -- I prefer to have a dialogue -- I have
13 chosen a method to self-limit myself to approximately
14 three minutes by reading from a prepared script.

15 So my apologies for this, but:

16 Automated scoring has the potential to
17 provide immediate, reliable and valid scoring of
18 constructive response items that would constitute
19 assessment tasks worth teaching to. Use of automated
20 scoring in assessment of common core standards would
21 extend a history of successful applications that
22 include scoring of simulation-based tasks, extended
23 essays, short textual answers, equations, graphs,
24 geometric figures, and spoken responses.

1 The history of ETS research on automated
2 scoring in consequential assessment includes
3 simulation-based tasks using computer-aided design
4 interfaces to construct architectural designs for the
5 1997 release of the Architect Registration Examination
6 (ARE), used by states as part of licensure
7 requirements for architects. It also includes the
8 first use of automated scoring of essays in
9 high-stakes assessments with e-rater for the Graduate
10 Management Admission Test (GMAT) in 1999, which was
11 followed by implementations for the Graduate Record
12 Examination (GRE) for graduate school admissions in
13 2008, the Test of English as a Foreign Language
14 (TOEFL) for undergraduate admissions of non-native
15 speakers of English in 2009, and the Praxis I
16 assessment for teacher qualifications examinations
17 later in 2011, among others.

18 Through experience with a range of different
19 item types, automated scoring engines, purpose of
20 assessment, and populations of examinees, including
21 English language learners, we now have a number of
22 principles that can guide us to successfully navigate
23 the challenges of implementing automated scoring in
24 consequential assessment. In their most succinct

1 form, they are:

2 1. Transparency. Automated scoring systems
3 must be transparent in their logic and design so that
4 score users appreciate the meaning that is embodied in
5 a score, particularly regarding the aspects of ability
6 measured, and whether by direct measures or proxies.

7 2. Empirical association. The association
8 between automated scores and other relevant measures
9 should be examined. Agreement between automated and
10 human scores is one part of this evaluation, but also
11 critical is the evaluation of association with
12 external measures of similar and divergent constructs.

13 3. Fairness. Previous research has
14 revealed that automated scoring can have notable
15 differences in the agreement between automated and
16 human scores source for some demographic groups. The
17 potential for such differences should be examined with
18 each implementation.

19 4. Monitoring. Once there is sufficient
20 evidence of quality for operational use, ongoing
21 monitoring of automated scoring is necessary to ensure
22 they remain true to their purposes in a dynamic
23 environment.

24 Our experience has shown that what may

1 initially seem challenging can become feasible through
2 persistent effort without compromising scientific or
3 ethical principles and a commitment to quality. We
4 believe that the consortia can capitalize on these
5 experiences, and these principles, to apply automated
6 scoring as part of fulfilling the promise of
7 assessment of common core standards.

8 MR. PATRICK ROONEY: Thanks, David.

9 Max McGee.

10 MR. MAX MC GEE: Hi. Good morning. Thank
11 you. This has been very educational.

12 I want to turn to the mathematics and
13 science. I know John brought up a question about
14 mathematics earlier.

15 Two sets of comments: One is a series of
16 recommendations. I am one of the several members of a
17 committee on Highly Successful Schools and Programs
18 for K-12 stem education sponsored by the National
19 Research Council and the National Academy of Sciences.
20 We have just finished drafting our report for
21 Congressman Walsh.

22 One of the recommendations in that report is
23 develop effective systems of assessment that are
24 aligned with the next generation of science standards

1 that emphasize science practices rather than mere
2 factual recall. As co-chair of Illinois' P-20
3 Council's Committee on Data and Assessment, we have
4 published a recommendation that says Illinois should
5 lead the nation, and, I guess, by extension, as part
6 of a partner of the consortium, lead the nation in
7 developing pioneering performance assessment items
8 aligned with common core standards, common core
9 standards including the mathematic practices, modeling
10 mathematics, make sense of problems and persevere in
11 solving them, the reason it was drafted.

12 So I'm very concerned because I haven't
13 heard too much about this whole idea of performance
14 assessment, yet there is a national commission and a
15 state commission that are putting these at the top of
16 their list of recommendations. I don't know how
17 computer scoring fits into them, but I do know that in
18 two international competitions they have solved this
19 problem, and I don't know what we are doing to look
20 beyond America.

21 Our students from the Math and Science
22 Academy recently participated in an international
23 contest on mathematical modeling. All the students
24 from around the world worked in teams of four. They

1 were given 36 hours to solve this problem. A regional
2 city, that has had lots of problems with gangs and
3 violence, they were given 15 data sets from the city,
4 from an actual city, anything from payroll, juvenile
5 crime, unemployment, and they analyzed the models to
6 give the city a plan to reduce violence. Now, that's
7 performance assessment. So somebody has figured out
8 how to judge this and judge it on an international
9 basis.

10 The second piece, I give workshops around
11 the state on assessment. I like to take ACT sample
12 items, a chemistry question where you don't even have
13 to know the chemistry. You have got to be able to
14 read and interpret the table on the one side of the
15 paper. On the back side, there is the Singapore math
16 and science assessment. The verbs from Singapore are
17 entirely different. In America they are circle, fill
18 in, identify. In Singapore the words are draw,
19 create, reduce, infer, suggest, explain, so on and so
20 forth. Singapore has figured it out on their national
21 assessment. Granted they are a country whose
22 population is 5 million, but they have still figured
23 this out.

24 So I hope that in your deliberations with

1 PARCC and SMARTER Balanced we consider what we can do
2 about quality performance based assessment, and then
3 maybe look at some of these other sources before
4 judging them.

5 I have 15 seconds left. So I will stop. I
6 will end at 15 seconds.

7 Thank you.

8 MR. PATRICK ROONEY: Thank you.

9 The last is Joe Dixon.

10 MR. JOE DIXON: Hi. Good afternoon. Thank
11 you very much for the opportunity.

12 I really just have three questions as I'm
13 listening to the discussion and trying to understand
14 how this will be implemented.

15 So one is more of a nuts-and-bolts question.
16 So what are the standards and protocols that will be
17 used to administer or import or export data between
18 the schools for these types of assessments?

19 So, for example, if the school is using some
20 kind of device like this (indicating), and is already
21 doing formative assessment, and it is taking many
22 different forms as far as being able to simply record
23 my answer via voice, being able to record my answer
24 via video, or using some kind of tool here, how can I

1 get that into kind of that larger test bank or that
2 larger data bank?

3 The other being someone mentioned the use of
4 real-world tools, and how do you propose that's going
5 to be available, and how do you keep that accessible?
6 And part of the follow-up is who are the partners who
7 are looking at that accessibility? Is there someone
8 from CAST or some other large center like that that is
9 actually doing work on accessibility?

10 Then, finally, what's the correlation or the
11 expected correlation between kind of the formative
12 performance of the student and the summative
13 performance? It is an obvious answer of what you
14 would hope to see, but I guess my question is what is
15 the relationship between the performances being
16 observed and kind of the real-world expectation of
17 that performance?

18 Thank you.

19 MR. PATRICK ROONEY: Great. Thank you.

20 Just to remind everyone, there will be an
21 opportunity at the end of the afternoon session for
22 another public comment period. If anyone would like
23 to sign up for that, they can do so during lunch at
24 the table where you registered this morning.

1 Before we go to lunch, we actually want to
2 take two minutes, and this will be quick, and hear
3 from Vic Vuchic from the Hewlett Foundation to talk a
4 little bit more about it.

5 MR. VIC VUCHIC: Thank you. I will be
6 quick.

7 So the Hewlett Foundation is exploring the
8 feasibility and the possibility of impact of doing
9 some sort of a prize to help advance the field of
10 artificial intelligence and smart scoring,
11 computer-based scoring, so we are able to support more
12 performance-based assessment and more complex measures
13 on a large scale.

14 I'm working here with Jason Morgan and Tom
15 Vanderark. We are just kicking off the feasibility
16 and exploration, if we could design this and whether
17 it is the right format to stoke innovation.

18 Some things that we are exploring are the
19 marketplace, is there a place where there isn't an
20 incentive, where a little bit of incentive would help
21 make a breakthrough; and then also can we construct
22 clear, crisp, objective challenges, that getting a
23 wider field, computer science field and other domains,
24 we could hopefully get some sort of innovative

1 breakthrough.

2 We will have some time, 20 minutes at the
3 end of this, to talk a little more in-depth. We will
4 have a conversation here.

5 I do have, and I will hand out here, a stack
6 up front for anyone to take, this is basic background,
7 with a couple of our guiding initial questions, and
8 there is contact information here if people from the
9 audience also want to look at this and help provide
10 some sort of feedback information as we are trying to
11 sort this out.

12 So thank you.

13 MR. PATRICK ROONEY: So, as Vic mentioned,
14 he has a handout. Anybody in the audience can grab a
15 copy, and I think he is looking for feedback from
16 anyone here today.

17 We will this afternoon, before the public
18 comment period, have a short, focused discussion about
19 the idea he has just mentioned with the group here.

20 So with that, I think we can adjourn for
21 lunch. As we mentioned this morning, there is not a
22 lot of options, but there are box lunches available to
23 purchase from the hotel.

24 We are going to try to have a short lunch

1 and start back up at 1:00 o'clock. So we would ask
2 everybody to be back here at five to 1:00 so we can
3 get started on time.

4 (Recess taken.)

5 MR. PATRICK ROONEY: We are going to go
6 ahead and get started now.

7 One quick announcement: We have had a
8 change in our table discussion. Howard Mitzel, he is
9 actually sitting in the back because his voice is
10 gone, and he has asked his colleague, Sue Lottridge,
11 from Pacific Metrics to take his place.

12 With that, we will turn to the afternoon
13 discussion. Our goal this afternoon is to bring the
14 conversation down a level and to talk with some
15 specificity about what PARCC and SMARTER Balanced
16 definitely need to be thinking about as they are
17 putting together their scoring system, that is going
18 to include automated scoring, to give them some
19 nuts-and-bolts ideas and things to implement and keep
20 in mind.

21 So, with that, we will have the same format
22 we used in the morning where the presenters will each
23 have five minutes. I apologize for the brief time,
24 but please try and keep it to five minutes. Then we

1 will have a couple minutes of reaction time from the
2 panel, and then we will go to the next expert after
3 that, and then we will open it up for a full
4 discussion.

5 So Brian is going to go first.

6 Thanks, Brian.

7 MR. BRIAN CLAUSER: Thank you.

8 What I'm going to try to do in five minutes
9 is summarize everything I think we have learned from
10 20 years of working on automated scoring for our
11 simulations.

12 We looked at a lot of different approaches
13 to automated scoring, and much of this work goes back
14 15 years that the original work was done, and then
15 much of it was redone a year or two ago.

16 Since we have looked at a lot of approaches,
17 rule-based scoring approach is just what it sounds
18 like. You develop rules so you have a set of logical
19 statements: If this, then this, then this. The score
20 equals such-and-such, and it completely describes what
21 you think the expert is doing or what the expert says
22 they are doing.

23 Regression-based approaches are exactly what
24 we talked about before where you were simply trying to

1 predict what the expert is doing using characteristics
2 of the performance and expert ratings as a dependent
3 measure. Those are the two approaches that we looked
4 at where each task has its own scoring algorithm.

5 We also looked at a number of approaches.
6 We didn't have to do so much work for every single
7 task where likely you had unit weights, so good things
8 get a point and bad things lose a point, or fixed
9 weights where these sorts of things that are really
10 bad lose three points and these things that are really
11 good, arbitrarily or not so arbitrarily, get three
12 points. Averaged weights are where you have a lot of
13 regressions, where you say the average weight for this
14 category is this.

15 Interestingly, to me anyway, when we did
16 this work 15 years ago, I published a bunch of studies
17 where I was the first author, and it was really clear
18 that the regression approaches work the best. No way
19 around it. It worked the best. It was most reliable
20 and best correlation with what the raters were doing,
21 and then we redid this stuff a year or two ago, and it
22 wasn't true anymore. The rule-based approaches were
23 better; higher correlations with the experts, and they
24 were also more efficient, and so forth. So things

1 change over time, and I will get into why I think that
2 is so.

3 A summary of the research in general, I
4 think there are three things we learned, and the one
5 thing is that the case-specific scoring algorithms
6 worked better than the general algorithms that were
7 supposed to apply to all cases. The correlations with
8 the expert ratings were substantially higher for those
9 algorithms, and just undeniably so. So the efficiency
10 of developing the algorithm once really didn't pay off
11 very well.

12 Interestingly, the general algorithms were
13 more reliable. The inter-correlation of cross tasks
14 was higher, but because they have a lower correlation
15 with the expert rating, it was pretty clear that what
16 we were capturing with them was some sort of construct
17 variance, and I offer that as kind of a caution, that
18 you can produce scores that seem to work well, and
19 will be quick and reliable, but are actually capturing
20 something that you weren't trying to capture.

21 Now to why we had this change. It became
22 clear to us that the rule-based scoring algorithms
23 required substantially greater clarity on the part of
24 the experts about what they were doing, and it was

1 because over the course of 15 years of doing this the
2 people who ran the meetings to elicit the criteria
3 from the experts either got a lot better at it or
4 maybe just a lot pushier at forcing people to say what
5 they were really doing, and they didn't take: "Well,
6 we are physicians, and we use our professional
7 judgment, and this is a gestalt, and this is from the
8 gut." No, no guts involved here. "Tell us what you
9 are doing," and over time that made those procedures
10 better.

11 So, actually, let me just touch very briefly
12 on the two main approaches that we looked at. This is
13 a slide that you already saw this morning. It tells a
14 good bit about what we found with the regression-based
15 approaches. They did produce a great approximation to
16 what the experts were doing, and they were very
17 efficient, and they were very forgiving in terms of
18 the experts not making their criteria explicit.

19 At least from our point of view, these were
20 not very efficiently developed. They were labor
21 intensive in part because we had to use physician
22 experts as our raters and it took lots of ratings. We
23 typically would use five ratings per task, per
24 examinee, rather than the one or two that you might

1 use, and that's a lot of expert time.

2 The other thing about the regression-based
3 approach is that they work really well in the
4 aggregate, but for any given person or any given
5 subgroup of people they might provide results that are
6 strange. It is, after all, kind of a black box, and
7 when you have a black box, funny things can happen,
8 and it is very hard to understand what is really going
9 on.

10 Mark's example this morning about Queen
11 Ferdinand, and so forth, is an example, but we have
12 also found that there are anomalies that occurred at
13 very low rates, but occurred nonetheless, that did not
14 require the person to be smart to have stumbled into
15 the high score. They just accidentally had taken
16 advantage of something quirky in that particular
17 algorithm. So that's regression-based approaches.

18 The other side of this is the rule-based
19 approaches. They are like a black box. They allow
20 for very explicit evaluation of the scoring process,
21 and I think that's a real plus. The people who are
22 doing the scoring in areas other than essay writing is
23 probably likely to be even more important; history,
24 biology, whatever. They can look at them, and they

1 can say: "Yes, that's what we meant to do," and they
2 can also look at instances where they give one score,
3 and the system gave another, and explicitly say: "Oh,
4 the system needs to be tweaked for," and what usually
5 happens in our systems, the experts say: "Oh, yes, I
6 missed that," because the system is almost always
7 right when there is a disagreement.

8 We also found that they tended to be more
9 efficient to develop these scoring keys than with the
10 regression-based approach.

11 Now, the upside or the downside is that, as
12 I said before, the rule-based approaches require a
13 very detailed understanding of what the experts are
14 doing, and that is kind of the price you have to pay.
15 I have come to look at that as a really causative
16 thing about it because, from my point of view, it
17 really enhances the validity of what is going on. You
18 probably know what you are doing and you are getting
19 that very thing that you are asking for. So I feel
20 comfortable about that.

21 But my last point -- sorry -- the last point
22 about this is that the rule-based approaches might not
23 be something you can implement now. If your content
24 experts don't have the insight or you haven't figured

1 out how to pry it out of them as to what exactly they
2 are valuing, and what the rules really are, it might
3 be very appropriate to use a regression-based approach
4 in the interim.

5 Okay. Last point, just a couple of things
6 to think about, and these really do fall out from the
7 others, although it might seem like a leap of faith in
8 some sense: I think when you are thinking about the
9 future and what you want to do here, it is really
10 important to be open about what the scoring algorithm
11 is doing. The examinee needs to know what is being
12 scored, how it is being scored, and what the relative
13 component weights are. In the sense of an
14 examination, it is a game. It is unfair to ask people
15 to try and excel at that game if you don't tell them
16 the rules.

17 The other thing that we have learned is that
18 you will undoubtedly have unintended consequences from
19 the scoring approaches you use. Yes, people will
20 write more essays, but if it becomes known that these
21 certain characteristics of essays get the higher
22 scores, then those are the characteristics that are
23 going to be in the essay, whether they are good or
24 not, and in a certain sense these two points work

1 against each other because if you kept it a secret,
2 they wouldn't be doing that, but I think you need to
3 be open about it, and so they will do that.

4 MR. PATRICK ROONEY: Thanks, Brian.

5 I think we have time for one clarifying
6 question, if anyone has one for Brian, before we go to
7 the next.

8 MS. DANIELLE MC NAMARA: When we make
9 transparent exactly how the algorithm works, we also
10 run the risk of students gaming the system and
11 artificially using that algorithm. You are probably
12 dealing with a different population than I might be
13 dealing with, but what would you think about that?

14 MR. BRIAN CLAUSER: There is no question
15 that people are going to try and game the system, and
16 I think that's one of the reasons that the rule-based
17 kind of approach is the goal you should be going to
18 because I have no concern whatsoever about people
19 trying to game the system when we are scoring with
20 those explicit rules. Those explicit rules really are
21 the outcome of interest. If you know to do these
22 three tests, and then order this treatment, that's
23 what we wanted. So it is not an opportunity to game
24 the system if it really captures the criterion of

1 interest.

2 MR. PATRICK ROONEY: Thank you, Brian.

3 We are going to go now to the next
4 presentation, which is Danielle.

5 MS. DANIELLE MC NAMARA: Okay. So I'm going
6 to talk a little bit more in detail about natural
7 language processing and some of the explicit
8 applications that we have used and some considerations
9 in that.

10 So we have built two intelligent tutoring
11 systems. One is called iSTART, Interactive Strategy
12 Training for Active Reading and Thinking, and in that
13 system students learn how to self-explain text. So
14 they receive instruction on comprehension strategies,
15 and then they type in self-explanation, and then they
16 receive feedback on the quality of the
17 self-explanation, and then they improve in their
18 self-explanation, and it transfers to their ability to
19 comprehend difficult text.

20 In the Writing Pal, they learn writing
21 strategy. So it is a very different approach than the
22 essay assessors because they learn writing strategies
23 over nine modules, and they play games to practice the
24 strategies, and then they also write essays, and they

1 receive, instead of feedback, they receive feedback on
2 what sorts of strategies they can use to improve their
3 essays.

4 The other one is called the Coh-Metrix Text
5 Easability Assessor. It is the alternative to
6 readability assessments that we have been developing
7 as a link, as part of the common core standards, and
8 our goal is to provide educators with information on
9 the characteristics of text that can contribute to its
10 ease and difficulty.

11 So to get into some nitty-gritty, this is
12 kind of a grid on how iSTART works. The assessor, as
13 I told you, as I mentioned before, iSTART, all of the
14 systems that are used never use LSA alone. So, for
15 example, in iSTART, first, it is everything is an
16 interrelated process.

17 So first we remove common statements, and
18 the reason we do that is because sometimes they would
19 say "I don't know," and if you had an overall system
20 that "I don't know" might produce, can you say more
21 about that? And that's not very effective.

22 So then we do word-match counts, and then we
23 get LSA and cosines, and we check whether it is
24 irrelevant, short, similar or okay, and then we check

1 the quality and give final feedback. At any point in
2 time during this process, the system can stop and
3 respond to the user and give feedback on what they
4 need to do to improve the self-explanation.

5 This is one of our studies on the system
6 evaluation, and you can see that in this particular
7 evaluation it is a global evaluation. So it is a
8 score from 1 to 4 that is vague, sentence focused,
9 locally focused or global, and you can see the D
10 primes in this case -- we are looking at D
11 primes -- this translates to a correlation of about
12 .7, which are fairly high, and what is important is
13 that it is never wrong by 2, and the user responds
14 very positively to this that the system is fairly
15 accurate and is giving good feedback. Where we are
16 not very good at is identifying the explicit, the
17 actual strategy that they are using.

18 Here is the performance on untrained texts.
19 One reason that we are not very good at it is that we
20 try to build anytime, anywhere text, that is
21 corpus-independent systems, algorithms. So here is a
22 study where we show that the system generalized to
23 texts that were turned in by teachers in real
24 classrooms, and it shows, our study shows, that it was

1 highly reliable.

2 The other context is the Writing Pal, and in
3 this system we have chosen to, again, take a step-wise
4 assessment of the essay, that is we could take an
5 approach where we rate the entire essay. This is much
6 more reliable, but it gives you a score that does not
7 guide feedback to the user, to the student.

8 So first we assess legitimacy, then length,
9 then relevance, and then structure, and we have
10 determined through many corpus analyses that these are
11 the issues that predict quality, and then we assess
12 paragraph quality, and we go in order of assessing
13 introduction, body, and conclusion, and I'm giving you
14 a little bit of data on our accuracy of that, and that
15 is that we have in the current algorithm, that is our
16 algorithm this week, we have correlations of .5-.6
17 .4-.5, .2-.5. Our square is around .3, .2, .2.

18 You will notice that these are not
19 high-stakes ready. They are not very high. They are
20 acceptable for guiding formative feedback, but they
21 are not acceptable for guiding high-stakes feedback.

22 So one of the issues that we are facing in
23 essay grading is the extent to which you are giving
24 specific rubric feedback, that is what kind of

1 strategies they are using; or the specific quality of
2 whether or not they have included a topic sentence;
3 the quality of their argument or the quality of their
4 introduction, is that the degree to which you go, move
5 toward real-world performance. Then the rater is
6 inferring more, and the student is elaborating more,
7 and, as you do that, they diverge more, and you get
8 more variance on the raters and the students. So
9 reliability goes down, and validity, I think, goes up,
10 but this is what we are faced with.

11 One of our solutions in W-Pal is that we
12 have a teacher interface, and they can write prompts,
13 and they can also give their own feedback. They can
14 give rubric feedback, they can give a grade, and they
15 can tell the student whether or not what action is
16 needed.

17 The other content, as I mentioned, is the
18 Coh-Metrix easability component, and in that we have
19 developed several components that go beyond
20 readability, and what we are developing is a system
21 that allows teachers and educators to see the
22 difficulty on various characteristics of tests.

23 I'm going to go very fast because I think
24 I'm running out of time. Yes, I am.

1 This is the Website that we are developing.
2 As you can see, the teacher can copy and paste the
3 text in. They can click on analyze and the graph
4 appears with a verbal translation that is
5 automatically generated by the system.

6 Some considerations in developing this are
7 the ease and difficulty. That is we chose to
8 translate, to present the ease of the text rather than
9 the difficulty of the text, and that had to do with
10 the nature of our components. We had to consider the
11 graph components and the presentation of the graph,
12 the amount of information that we are presenting, and
13 also the wording and the number of choices on the
14 entire system. So this is just kind of human factors
15 that we considered in just this system.

16 In terms of teachers' needs, where we want
17 to go is a teacher might want to choose a text to meet
18 pedagogical goals. So, for example, they might want
19 to choose text high in cohesion to compensate for
20 knowledge. They also might consider pedagogical
21 strategies to compensate for text. So, for example,
22 they might want to have the students explain, discuss
23 and inference for low-cohesion text.

24 What we are trying to do is build a system

1 that provides teachers with information about the
2 text, that it is not overwhelming, it is easy to use,
3 provides what they need when they need it, and
4 provides information that they understand and can use.

5 The key to doing that is to work with
6 teachers, and we have done that both with W-Pal, and
7 we are going to be doing it more with the system that
8 we are building for Coh-Metrix, but it needs to be
9 inter-cooperative and invivo, and that is in the
10 classroom.

11 So a lot of the information that we gather
12 that is the most valuable is when you have the
13 teachers use the systems in the classroom and you can
14 see how they interact with it there. Having them come
15 to the lab is less informative.

16 Also, involving teachers in the design
17 process is very valuable.

18 MR. PATRICK ROONEY: Thank you, Danielle.

19 We are going to take just a minute or so if
20 anyone has any clarifying questions they want to ask
21 Danielle.

22 MR. JIM PALMER: Just a question on your
23 engine there for text complexity.

24 So much of what makes a test difficult is

1 how much prior knowledge someone has about the topic.
2 There is one test designer, I will leave out the name,
3 but what they do to make their most difficult test is
4 to find a topic that basically no one knows anything
5 about. So how do you put that into --

6 MS. DANIELLE MC NAMARA: One of the things I
7 specialize in is interaction between test difficulty
8 and prior knowledge; that's what I study, and one of
9 the reasons we built Coh-Metrix is because of the
10 interaction between prior knowledge and confusion.

11 So our goal is to have the teacher more
12 aware of the cohesion of the text, and then what I
13 would like to do now is to build a system that gives
14 specific information to the teacher on what happens
15 when you have that level of cohesion in a text and
16 what kinds of things they need to think about in
17 relation to the prior knowledge of the reader.

18 When I started this project, I wanted to
19 build a system that matched reader to text, just like
20 everybody in readability wants to do. I have really
21 given up that goal for a lot of reasons that I'm not
22 going to go into, but what I'm more interested in now
23 is interacting with the teacher and matching text to
24 the pedagogical goals, and matching pedagogical goals

1 to the text, and that involves the teacher and
2 recognizing the prior knowledge of their classroom of
3 readers, and the individual reader, but prior
4 knowledge is the key.

5 MR. PATRICK ROONEY: Thanks, Danielle.

6 I think we are going to now turn to the
7 third presentation.

8 So Mark?

9 MR. MARK SHERMUS: Thank you.

10 Before I launch into this, I want to make a
11 comment about gaming the system. This happens with a
12 lot of hand-scoring essays. The instructors, when
13 they are prompting their kids during the practice
14 session, they will say: "Well, first of all, you
15 restate the prompt, then you have a main statement or
16 a main theme, and then you have three points -- it has
17 to be three -- and then you have a conclusion, and
18 then a summary. If you do all that, you are going to
19 maximize your score on the state assessment," and it
20 works. It works.

21 The same thing with automated essay scoring:
22 You can try to game the system, but it is a little
23 smarter than you might think. So, for example, some
24 people will say: "Well, just write more, and that's

1 half the variance," and what happens with human
2 raters, which the technology follows, it is not a
3 linear relationship with length. It is a logarithmic
4 relationship with length, and what happens is that
5 human raters pay attention to length up to a point and
6 then it flattens out. They are no longer interested
7 in length. They are interested in other attributes.

8 It turns out on the models that are
9 developed for automated essay scoring, there is
10 usually about 40 significant predictors. I would
11 submit to you if you had mastery of 40 aspects of
12 writing, you are probably a good writer. So that's
13 the way I would look at it in terms of gaming the
14 system.

15 Anyway, what I wanted to talk about is the
16 idea of going back to the notion of integrated
17 scoring, automated scoring with instruction, because I
18 think, in terms of access and in terms of
19 special-needs population and the like, getting the
20 technology in the hands of the kids on a day-to-day
21 basis is really where you need to go, because if this
22 ends up being kind of a special thing, you are going
23 to have all kinds of learner inhibitor effects.

24 So just integrate it with the instruction,

1 and this is how you can do it: You can develop, say,
2 15 writing prompts. You can do more, but let's say
3 15, and the reason I say start off with 15 is because
4 the way schools are configured, they typically don't
5 have a computer for each kid. What they typically
6 have is a writing lab or some sort of multimedia
7 center where a class at a time can go and work on
8 this, but you would have more writing prompts, fifteen
9 a year that these kids would be working on. The
10 teachers would use the prompts as a way to illustrate
11 some aspect of writing that they want to illustrate.

12 It turns out that some research has been
13 done about the number of actual essays that are
14 administered in a high school writing class per
15 semester. What would you guess it is? Three writing
16 assignments per 16-week semester in each high school
17 writing class. So this is a way to sort of get more
18 writing done, and if there is anything I know, after
19 many, many years of educational research, if you want
20 to be a better writer, you have got to write more.

21 What you can do is map the growth of a kid's
22 writing over time, and what you can agree is to take
23 the average of the last three essay administrations as
24 the high-stakes test, and you can actually keep those

1 secret from teachers and have multiple alternatives if
2 you are concerned about security, but that's a way to
3 do that, and what you get is like a growth curve that
4 might look something like this. This is something
5 that we would be very happy with as a result.

6 So they start off with an average score of
7 2, and then they kind of end up with an average score
8 of 5 on a 6-point scale. If you did that with the
9 grade, I'm sure we will all be happy.

10 Here are some advantages: First of all, you
11 get instantaneous feedback, and the reason that's
12 important is because, especially with most high-stakes
13 tests, teachers don't get the scores back until like
14 May 23rd. So it is nothing they can do with that.

15 So to get instantaneous feedback would be
16 great because one problem that you have is placement
17 for many teachers and kids moving into the district.
18 You are trying to get a calibration as to where their
19 skill sets are. You have more writing. You could use
20 this in a formative sense rather than just a strict
21 accountability sense.

22 The scoring standards become a little bit
23 more clearer to the students, and you could get
24 diagnostic information at least from some vendors

1 about what is working and what doesn't seem to be
2 working, and there is some research that suggests that
3 this approach also would impact on reading scores
4 since the correlation between reading and writing
5 tends to be so very high.

6 I have suggested here in these slides some
7 criteria for evaluating some of the AES products that
8 you might be looking at: Whether you can look at
9 their conceptual approach; some take an empirical
10 approach, some take linguistic. If you look at the
11 languages that they either provide feedback in or
12 actually score. Their accuracy. Essay length.
13 Availability of prompts. I think there was a question
14 earlier about the capacity to add prompts, and some of
15 the vendors have that. The number of essays that they
16 can do, they can handle, and their portfolio systems
17 that they happen to be associated with.

18 The gentleman just before the break was
19 talking about do we just have the summative
20 information, and the fact is if you get lots of
21 information on students, you can determine the kinds
22 of tools that they are using to form their essay. You
23 can count the amount of time that they are actually
24 spending on making revisions. All kinds of things are

1 available as sort of intervening variables that you
2 can look at.

3 All of these portfolio systems have great
4 student tracking features. You can aggregate up to
5 the district and up to the state as far as I am aware,
6 and you can get multiple feedback languages. So if
7 the kid is writing in English, but their primary
8 language is Spanish, most of the vendors will provide
9 feedback in Spanish so that the kid can get some
10 direction.

11 There are a number of different writing
12 tools, everything from idea generation to Venn
13 diagrams to character development. Some of these seem
14 to work better than others, but there is a whole host
15 of tools that teachers don't typically have the time
16 to incorporate when they are talking about their
17 rhetorical skills and creative skills. Those are
18 built into these systems.

19 There is curriculum where writing
20 instruction has been integrated, and there are a whole
21 host of add-on capabilities. So one of the things
22 that, especially in the high school, that everybody is
23 concerned about is plagiarism, and instead of the
24 teacher having to be knowledgeable about all areas,

1 the vendors can actually help you detect plagiarism if
2 it is present. So if there is some copying and
3 pasting, that will be picked up through the automated
4 assessment.

5 Here are the NCLB implications. As I
6 mentioned before, it does integrate testing and
7 instruction.

8 My son just graduated from high school,
9 thank God, and he has taken high-stakes tests since he
10 has been in first grade, and the number one thing he
11 says about them is "They are so boring," and I think
12 that translates into student motivational issues that
13 states are grappling with. I think one of the
14 advantages of some of these things is to get over some
15 of the motivational issues, and I think that is worth
16 something.

17 Test prompts can have local or national
18 norms if you want them to, high reliability, instant
19 feedback, and very cost effective. These are all
20 things that the NCLB legislation was really designed
21 to get at.

22 MR. PATRICK ROONEY: Thanks.

23 Does anyone have any clarifying questions
24 for Mark?

1 Okay. Dan?

2 MR. DAN LONG: In your last comments, you
3 were talking about cutting down testing and test
4 preparation time, but yet offered the opportunity to
5 have more writing pieces, that most could be
6 considered as instructional purposes or testing
7 purposes, or how did you, with making the comment of
8 cutting down the testing and test time, how could you
9 offer a model that would say more testing might be
10 perceived?

11 MR. MARK SHERMUS: Well, the testing and
12 instruction for the student becomes ubiquitous. They
13 don't think about it. It is kind of like if you have
14 had a child who does video games -- any of you have
15 kids who do video games? If you observe a teenager
16 involved in video games, they can actually learn
17 something, but they are so involved in the situation,
18 and they will work so very hard to get to that next
19 upper level. It is truly amazing, and it is because
20 the entire experience is integrated, and it is a
21 performance assessment. A video game is a performance
22 assessment.

23 So what I think what we are shooting for is
24 something that is so integrated that they don't even

1 know it is a test. They actually might have to be
2 reminded that this is something that they really need
3 to attend to, but it is certainly ubiquitous that they
4 don't even know it, and they give it their highest
5 level of effort because it is ubiquitous. It is part
6 of the instructional experience.

7 MR. PATRICK ROONEY: Thanks, Mark.

8 Now we will go to the last presentation, Sue
9 Lottridge from Pacific Metrics.

10 MS. SUE LOTTRIDGE: All right. Thank you.

11 Well, I'm kind of winging it. So if I get
12 kicked in the back, I didn't interpret the slide
13 right, and Howard is letting me know.

14 So what we first want to talk about is
15 considerations that the consortia should think about
16 when we want to integrate automated scoring into a
17 large scale assessment system, and what are the
18 factors to consider, and these are listed on the
19 slide.

20 The first really comes down to program
21 stakes, how are you using the assessment and what are
22 the stakes associated with the scores. Is it a
23 formative assessment? Are teachers going to use it
24 for instruction, for a benchmark assessment? Is it a

1 summative assessment? With each of those different
2 kinds of uses, you are going to have different levels
3 of error tolerance.

4 For high stakes, you are going to have very
5 little tolerance for error. For formative assessment,
6 you may be more tolerant of error, and you also may
7 allow teachers to change scores, and view responses,
8 and modify things accordingly. I think these are very
9 important in terms of what kinds of items you are
10 going to allow in a test and what kinds of model you
11 use to score. So you may blend human scoring and
12 automated scoring, and the stakes are what really
13 drives these choices.

14 Public acceptance is another thing to
15 consider. In some situations, people just simply will
16 not tolerate automated scoring, or you have to somehow
17 encourage people to consider it as an option that is
18 feasible and acceptable, at least when faced with that
19 perspective.

20 Content areas, I think this is less
21 critical. So certain content areas lend themselves to
22 certain classes of items, and I think they really come
23 down to kind of a two-dimensional grid, which is the
24 extent to which there is a correct response, is it

1 just a single answer, kind of what we often see in
2 mathematics problems; or are there multiple correct
3 answers, and is there some level of complexity to
4 human judgment in the scoring.

5 So does the human have to do a lot of review
6 and thinking about how to score that item or that
7 response or is it simply a snap judgment, and I think
8 those kinds of considerations will really shape what
9 automated scoring approach you should take.

10 Grade levels, in lower grades, kids don't
11 spell as well, and dealing with some of the issues
12 that are grade specific is something to consider.

13 Cost has been raised multiple times. It is
14 something to consider in terms of what kind of human
15 scoring will you have, if any, and how much will
16 automated scoring cost relative to human scoring.

17 Turnaround time, is it required that it be
18 immediate, and what is possible in terms of the
19 difference between scoring and recording scores.

20 Opportunity to tailor items for automated
21 scoring, as Mark raised in the morning, a good item is
22 a good item, but with automated scoring, you can
23 improve scoring if you can design the item to kind of
24 leverage the strengths of automated scoring. So you

1 have kind of one idea per scale or you can sample the
2 item appropriately to get at each individual concept
3 that you are looking for.

4 I think another case is the hand-scoring
5 vendor's experience and flexibility with automated
6 scoring, and here, as you will note in this slide, we
7 really see automated scoring working in conjunction
8 with hand scoring, and if that's true, then the
9 hand-scoring vendor needs to be able to work with
10 automated scoring in some way, and making sure that
11 that communication process is clear, and you know kind
12 of how they are going to work together is important.

13 What is not on here is also how to make sure
14 you're scoring students with disabilities or students
15 who are English language learners appropriately and
16 how you monitor that. Adaptive testing was raised by
17 the SMARTER Balanced consortia and how can automated
18 scoring fit with the manual.

19 So short constructive response essay, there
20 are a range of items, multipart items, that we have to
21 consider when we think what is appropriate for
22 automated scoring.

23 So for procurement and technology standards,
24 what should the platform look like? First, I think it

1 should be independent. This means that the platform
2 sits outside of a test delivery system. So the test
3 delivery system captures information, sends it to an
4 independent platform that scores it, and then returns
5 a score or feedback or whatever information is
6 required by the system.

7 The nice thing about this is modularity is
8 always nice. This allows things to be kind of hooked
9 together in kind of seamless ways. It allows you to
10 really leverage the strengths of each system.

11 Configurability, items should be
12 independently configured. So here what we are talking
13 about is what model for combined human scoring and
14 automated scoring is most appropriate given what you
15 are trying to do. So if you have a very low error
16 tolerance, what you may want to do is use automated
17 scoring to score the responses that you are sure you
18 can score without any error. You send everything else
19 in for scoring. If you want to monitor human scoring,
20 you can use it as a way behind, a second read.

21 There is a lot of ways you can use both, and
22 I think you really need to be able to have those
23 possibilities open in your platform to handle the
24 different pathways of data.

1 Reliability, this is just the quality of
2 scoring. You just want to make sure that you are
3 scoring well and consistently over time, and I think
4 another piece of this is quality assurance. It is one
5 thing that we have really worked with, is how to make
6 sure that everything is verified so that, when you
7 start testing, you know that you are using the correct
8 model and getting the correct results.

9 Flexibility, we talked earlier this morning
10 about whether you need multiple systems to score
11 multiple different items, and, at least with our
12 system, it is basically one platform that can handle
13 short constructive response, and essays, and different
14 kinds of extended response items; and what happens is
15 a response comes in, and it kind of gets flowed to the
16 different scoring modules within the platform, and I
17 think that is a real strength, is to be able to have a
18 single system to kind of manage that flow because what
19 you then can do is resolve the scores from different
20 modules in one platform.

21 If you have multiple platforms, you have to
22 figure out, if you want to have the flexibility to
23 send responses to separate models, you have to somehow
24 manage to combine the information from different

1 modules into a single score, or a feedback cove, or
2 whatever it might be.

3 We have already talked about the clear
4 pathway to configure with human scoring. So knowing
5 what pathways are available and how to kind of flow
6 the data through all the different scoring sources,
7 because if you combine automated and human scoring,
8 you have a level of complexity you didn't have before.
9 You have the automated scoring system. You have to
10 kind of manage both processes and both sources and
11 make sure that everything is working well together.

12 Batch and interactive processes, you can
13 score immediately and return those scores back to the
14 assessment platform or you can batch score, and, as
15 Mark mentioned earlier, batching can really help you
16 with detecting plagiarism. You can try to identify
17 two common responses within a course or a common
18 proctor, that sort of thing.

19 Integration with hand-scoring vendor's
20 software and protocols and with item delivery
21 software, we talked about this a little bit, but how
22 do you work with the hand-scoring vendor to
23 incorporate and use the automated scoring data in
24 their greater monitoring processes, and with item

1 delivery software I think what Howard means is how do
2 you incorporate automated scoring integration.

3 Let's see. Where are we now? Support
4 multiple uses, we have talked about a lot of these,
5 that you can use automated scoring in many different
6 ways to support many different uses of the data. So
7 plagiarism if you are doing batch scoring; reader
8 monitoring; actual assigning a score to students;
9 providing instructional feedback, if you can; and
10 teacher professional development in the sense, if you
11 are using in a formative platform, you are providing a
12 model on how one might score using a rubric.

13 One critical piece of automated scoring you
14 need to think about is that you really do need to
15 monitor the system. You can't set up parameters and
16 then let the system run on its own. You need to,
17 every day, make sure that what you are seeing is what
18 you expect to see in terms of score distribution,
19 because nobody lays their hands on the data if it is
20 simply automated scoring.

21 I think I'm running out of time, and I have
22 a lot of slides. Do you want me to continue or should
23 I stop?

24 MR. PATRICK ROONEY: You can summarize it

1 up.

2 MS. SUE LOTTRIDGE: So I think we can skip
3 the summary because we talked about this.

4 We talked a little bit about the blended
5 scoring model, and this is the one we use in
6 Louisiana, and it is a situation where there is
7 high-stakes tests. There is no tolerance for error.
8 So what we do is we run things through the automated
9 scoring system first. We use the automated scoring
10 system to assign scores to responses that we feel we
11 can score without error, and everything else is done
12 off of hand scoring.

13 So we use hand scoring as the judgment of
14 the more complex responses, and we use automated
15 scoring for really what it does best, in this
16 situation to simply assign a score when things are
17 easily recognizable as having a score, because there
18 are some responses that are simply easy to score.

19 Second scoring, so using automated scoring
20 as a second reader, and this is really nice if you
21 want to stabilize and monitor, stabilize human scoring
22 because we all know raters can drift. So this
23 provides a consistent scoring tool across all the
24 administration.

1 Human scoring as a read-behind for automated
2 scoring, I think we will never get away from this in
3 some sense. You need some sort of backup to monitor
4 the fact that automated scoring is actually working
5 the way you intend over time.

6 Human scoring as an conditional read-behind,
7 I think this is another important piece. If the
8 automated response system identifies responses that
9 look problematic or outside of the range of what to
10 expect, you need humans to be able to assign scores to
11 those. So you need to flag them and send them off for
12 an expert judgment in some sense.

13 The last thing here is say you have a
14 high-stakes situation and the constructive response or
15 essay score can really impact the judgment of a
16 student's proficiency. So the student is at or near
17 the cutting point. What you may want to do is, for
18 those responses, send those off for human scoring. So
19 this has some public acceptance factor to it because
20 you are not relying on that automated score to
21 determine whether the student makes the cut.

22 MR. PATRICK ROONEY: Thanks, Sue.

23 So before we jump into the full discussion
24 of everyone's points, I will give a minute if anyone

1 has a clarifying question for Sue and for Howard's
2 presentation.

3 Shelbi?

4 MS. SHELBI COLE: I just want to make a
5 point with respect to error tolerance in terms of
6 computer adaptive testing because one of the things we
7 know about computer adaptive testing is that if a
8 high-ability child were to answer an easy question
9 wrong, the computer has some way to recover from that
10 error, and I suspect that we might be able to get a
11 way, we may be able to do our research, but with a
12 high-error tolerance given the computer's ability to
13 recover one way or another based on that error.

14 So I think that would be definitely
15 Mohamed's area for research and evaluation, but really
16 to think about how much error can we put into a test
17 without really affecting the tool or the score.

18 MR. JOHN JESSE: A procurement question you
19 skipped on the slide. So we will do some system
20 architecture, and we will have our test design and
21 item specs and types, and then we are ready to start
22 acquiring, and building, and putting together
23 different pieces of that architecture.

24 So on the delivery system, I think we have a

1 pretty good idea of what we want through experience.
2 The states can pretty much tell you these are the kind
3 of components, these are the factors that we know work
4 because there has been enough experience in all our
5 states.

6 But then we come to this AI engine, and
7 there is very limited experience based on the
8 knowledge of the different, shall we say, brands or
9 models of scoring. As I heard you talk this morning,
10 there is different ways we go about this, and it
11 seems, once we decide, we are somewhat committed with
12 respect to that design model, which is a little bit
13 intimidating thinking if we make that misstep.

14 So can you take a moment and talk about,
15 advise us, counsel us -- and maybe it will be us being
16 one, the consortia together, making this
17 decision -- what kind of guidelines would you suggest
18 would help us and guide us in the procurement since it
19 would be such a high-stakes decision, it seems to me,
20 at that point?

21 MS. SUE LOTTRIDGE: Well, I see two things.
22 One is the question about what happens if you switch
23 engines; is that right?

24 MR. JOHN JESSE: Yes.

1 MS. SUE LOTTRIDGE: And the second question
2 is what criteria do you expect from a vendor who is
3 doing automated scoring to ensure that they provide
4 quality scores. Is that kind of the two sides of your
5 question?

6 MR. JOHN JESSE: Well, we are going to have
7 to decide which engine to begin with, and how do you
8 decide which?

9 MS. SUE LOTTRIDGE: I think Mark provided a
10 good description. You can look at content validity,
11 how does the system work, what are the systems,
12 experience with the items that you are hoping to
13 score, and do they have any evidence of the validity
14 and the reliability of those scores.

15 I think you really should -- and I'm back on
16 process because I think it is important -- you should
17 request of a vendor the kinds of processes they are
18 going to do to ensure that they are using the correct
19 version of the system, that they have a validation
20 process, that they have kind of everything in place to
21 ensure that everything is going to run smoothly.

22 So you have the judgment of the engine, but
23 then you have the judgment of the processes by which
24 they are going to implement the engine in an

1 operational environment.

2 MR. KEVIN KING: Sue, I want to press a
3 little bit on John's question. There seems to be a
4 lot of emphasis for automated scoring, for the scoring
5 engines under the hood, so to say, and that seems to
6 be very specialized and tailor made.

7 Well, we live in a world that awards
8 contracts. I mean, at some point in time it forces
9 the real work through competitive bid, and we are also
10 coupled with the idea that we are trying to really
11 press, at least for SMARTER Balanced, and at least I
12 think PARCC on this, the issue of open source
13 programming.

14 So I sort of press on that. We are talking
15 portability, not just of items anymore, but of
16 scoring, and then also open source issues and what
17 that might do to procurement in definitely a public
18 sector.

19 MR. MARK SHERMUS: I think that's a good
20 point, and I think that one caution I would give to
21 you is not to try and fix things so simply.

22 I think we can get relatively good
23 performance across all the major vendors, but the
24 analogy I would use is that automated essay scoring is

1 kind of where computers were back in, say, 1985. They
2 worked. They did the job, basic functionality. They
3 were great, but they haven't arrived yet, and if you
4 try to fix things -- and when I say "fix things" that
5 is get things in cement through the procurement
6 process -- you end up with something like we would
7 have ended up if we had fixed things back in 1983. We
8 would all be using Commodore 64s.

9 I would just caution against trying to get
10 it so standardized right now, and let the vendors
11 continue their development, and make strategic
12 investments about them doing that, because with the
13 different vendors working in competition and in
14 collaboration with one another, you are going to get a
15 better product, ultimately, down the line.

16 MS. SUE LOTTRIDGE: Again, what you might
17 want to do is plan for the eventual change of vendor,
18 and have a validation and training session or standard
19 that is the one you use to train the model for your
20 current use, and then when you move to a new vendor,
21 you kind of use that as your model because they do
22 perform very similar.

23 So why don't you just try to make the change
24 as seamless as possible. You may have a different

1 engine, but it might be just like changes to a
2 different hand-scoring vendor.

3 MR. PATRICK ROONEY: Jim is going next.

4 MR. JIM PALMER: For those of you who were
5 at the fall ISBE meeting, from a technical-issues and
6 large-scale assessment, they had a discussion on AI
7 scoring there, and one of the vendors had come to the
8 conclusion that they weren't going to develop their
9 own engine. They were going to lease it from a vendor
10 that had produced one or had already developed one.

11 So they ran some papers they had through the
12 various engines of both writing, science and math, and
13 what they found was one engine was slightly better for
14 each subject. They found one that was pretty good at
15 all three, but none that really stood out, and I think
16 that is kind of what Mark is getting to.

17 MS. DANIELLE MC NAMARA: I was just going to
18 point out the value in funding not only vendors, but
19 researchers.

20 MR. BRIAN CLAUSER: Particularly speaking of
21 researchers, the comment was made about open source
22 software, and I think if software can be developed to
23 do the basic scoring things that different systems are
24 doing now, but made available open source, there are a

1 lot of researchers out there, a lot of graduate
2 students in psychometrics programs, who probably study
3 computational linguistics, who would be happy to get
4 involved in it; and if the consortia not only made the
5 software available, presumably with the idea that you
6 had to give it back, open source, if you improved it,
7 but also makes the data sets available, you would have
8 an army of graduate students doing doctoral
9 dissertations on this, and it would be win-win for
10 everyone.

11 There would still be a need for vendors to
12 actually run the software and more or less guarantee
13 that it was doing what you thought it was doing, but
14 it would open things up and create the opportunity for
15 this kind of really order-of-magnitude change and
16 improvement because you have so many more smart people
17 working on it.

18 MS. ANN WHALEN: Brian, can I ask you a
19 question? Are you guys building your own or did you
20 work with vendors?

21 MR. BRIAN CLAUSER: The simulation that we
22 have we built from the ground up, and we built it from
23 the ground up, and, more or less, locked it in stone
24 so that it is the equivalent of Commodore 64. It was

1 developed a very long time ago, and for the
2 simulation, there aren't a lot of other people who
3 would be really interested in having that simulation
4 because it is so narrowly defined. We have a few
5 clients who are interested in use in some sense, but
6 not very much.

7 For the other work that I mentioned very
8 much in passing, the scoring, the dictation notes that
9 examinees write, we have worked with two different
10 kinds of vendors at two different times about ten
11 years ago, before that test went live, that we used
12 the cumulative scoring for. We had a vendor who did,
13 as I say, kind of work for us, and they produced
14 really good results.

15 It turned out that it was also incredibly
16 expensive because the number of people to write a note
17 for each task was relatively small, and the vendor
18 wanted a lot of money.

19 More recently, we have been working with
20 another kind of vendor. Basically, we made an
21 agreement with a group from the UK, at the university,
22 who are computational linguists, and we are developing
23 things with them, and it is kind of a shared activity.

24 MR. PATRICK ROONEY: I have one, actually,

1 for Sue based on something you were talking about.

2 You end up having a scoring system, which
3 strikes me as kind of a good thing to do, but then
4 that brings up competing questions of you have to make
5 sure it is interoperable with everything else and what
6 the challenges might be there.

7 The other thing that you said, which struck
8 me as kind of competing, is you use the right items
9 that take advantage of the strengths of an automated
10 scoring system, but if it is a separate system being
11 prepared differently, how do you know what the
12 strengths are with the automated scoring system to
13 write that or take advantage of that, or is it just
14 better to flip it around and say: "Here is what we
15 need. Here are the items you are writing. You come
16 to the table and tell us that you can do that"?

17 MS. SUE LOTTRIDGE: Well, I think automated
18 scoring works best when you have the automated scoring
19 representative as part of the item-writing team
20 because they can, as part of the item review of the
21 automated scoring system, provide feedback and say.
22 "Well, you might want to consider breaking it into two
23 pieces or doing it this way."

24 So although the system may be independent,

1 the automated scoring discussion around the item
2 design and scoring the rubric can be done together.

3 Does that make sense?

4 MR. PATRICK ROONEY: Sure.

5 So that means they would need to have, as
6 they are going into the item writing, a sense of what
7 their automated scoring system vendor might need, so
8 that way they are bringing that piece to the table, as
9 they are taking things out, and field testing them,
10 and see if they actually work already?

11 MS. SUE LOTTRIDGE: Well, I shouldn't speak
12 for the automated scoring vendors, but I would think
13 that all of them have similar requirements of the
14 items.

15 Some might be more stringent about what they
16 would like to see in an item, but I think there is
17 general -- and this would be useful to
18 produce -- general item writing guidelines for what
19 would make something more scorable by automated
20 scoring, and a lot of it comes down to clarifying the
21 task demand for the students.

22 A lot of times when you see a constructive
23 response item, it is pretty clear that the student
24 just didn't know how to respond. Some of it is good

1 item writing, and other pieces are the more discrete
2 you could make responses, the better it is for the
3 computer to score, I think just as a general
4 principle.

5 So I think having some guidelines would be
6 useful for what would make something more scorable
7 with automated scoring, without, hopefully,
8 sacrificing the content of the item.

9 MR. PATRICK ROONEY: So I'm trying to think
10 how the guidelines -- it seems like the automated
11 scoring system, because they are kind of complex,
12 "black box" like Brian was talking about, it would be
13 hard for the states to say: "Here is how we can take
14 advantage of what the different automated systems do."
15 Where do those guidelines come from that it seems like
16 it is a sensible step?

17 MS. SUE LOTTRIDGE: I think you can ask for
18 a request for information, or something like that,
19 from possible vendors, what they would like to see in
20 items.

21 MR. MARK SHERMUS: Actually, some do have
22 guidelines. That kind of information would be easy
23 enough to get.

24 You know, I think, like I had mentioned

1 before, a good prompt is a good prompt, and if it is
2 working well for your human scorers, it is going to
3 work well for automated essay scoring. You are just
4 not going to get that much of a difference.

5 I think in terms of the planning, what you
6 probably want to do is really make sure that if you
7 are dividing things into, say, particular genres -- I
8 think this is where content is going to play a
9 role -- then I think you want to be very particular
10 about the degree to which you expect content to play a
11 role in the scoring of the response vis-a-vis an
12 argumentative prompt where content really isn't coming
13 into play and it is really more writing ability and
14 rhetorical skills.

15 So I think that's where you really have to
16 be careful in defining this as a narrative prompt or
17 persuasive prompt, and the degree to which it is
18 variably persuasive in terms of your expectations of
19 content. If you have to do a dance around anything,
20 it is probably that component.

21 MS. ANN WHALEN: So can I ask what advice
22 you have for the consortia given the complexity of all
23 we have talked about today in terms of this guidance?
24 So, as you pointed out before the break, it varies

1 based on content and item type, but we do not want to,
2 in 2011, play to the current state-of-the-art in 2011.

3 So how do you think about, right now, asking
4 questions and getting information needed in order to
5 play to the state-of-the-art in 2014, and the
6 state-of-the-art in 2020, and the state-of-the-art in
7 2025?

8 MS. SUE LOTTRIDGE: Well, I wonder if the
9 state-of-the-art in 2014 and 2025 will be more
10 technology-enabled items and less automated scoring.
11 It might be a combination of simulations and things
12 that we may just not be able to predict or automated
13 scoring just might not be useful for, but other
14 scoring models will be, but I don't know.

15 MS. ANN WHALEN: So I believe I have to pull
16 myself back. How about 2014? Forget 2020. How does
17 Wes and John and Jim and Jennifer start thinking now
18 about the right questions to ask their teams to go
19 back and think about these different content and
20 different item types in order to appropriately engage
21 the solution in their assessment system?

22 MR. MARK SHERMUS: What I would do is look
23 at your common core standards and what you are trying
24 to generate out of the common score standards, and

1 then say: "Okay. Ideally, what would be the best way
2 to assess this content domain, or these set of skills,
3 or these dispositions?" And you may come up with
4 something that automated scoring in 2011 can't do, but
5 may get some assurances from vendors that by 2014
6 maybe it is going to be there.

7 So do what you can for 2011, and then we get
8 to incorporate it on an integrated basis based on your
9 vision of the kind of item or of the item types that
10 will ultimately fulfill the best assessment experience
11 in terms of, number one, getting the information that
12 you really want; and, number two, what is going to be
13 motivational to kids in terms of their willingness to
14 put forth their best effort to demonstrate to you that
15 they know something or they don't, and I think it
16 would be that kind of approach.

17 So if you are looking for next steps, lay it
18 all out, get the best item types that you think you
19 would really like to see, and then measure where the
20 technology is and where its trajectory is to get that
21 type of item. You may go through, as I referred to, a
22 cottage-type industry where you have got something
23 that is kind of an jerry-rig for a year or two until
24 you got something that you really want, but it is not

1 so far that it is somehow discredited or you couldn't
2 do the job.

3 MR. BRIAN CLAUSER: Yes, I don't have too
4 much more to add to that. It is just that I think
5 three things: In the very short run, you shouldn't
6 imagine that anything is going to change. So plan to
7 use in the next, you know, 2012, 2013 what exists
8 right now and what people are commonly doing.
9 Miracles are not going to happen, but invest a
10 considerable amount of your time and effort in a
11 research agenda because that's what will make things
12 change over time.

13 Decide what the most important things are to
14 have change and invest your money in an effort in
15 making those things change and getting there.

16 The third thing is be careful not to do
17 things just because that sounds like a good idea.
18 Multiple-choice items are really good for a lot of
19 reasons, and there are times when you should replace
20 them with something else, but you should replace them
21 with something else when you can generate empirical
22 evidence that the something else is doing a better
23 job.

24 Now, better could be that people are writing

1 more, provided you are really satisfied that they are
2 not only writing more, but they are writing more and
3 well. If they are just following some really poor
4 rubrics and writing a lot of words or words with lots
5 of syllables, you haven't bought very much.

6 So it can be that the consequences is an
7 important part of the outcome, but you really need to
8 be looking for empirical evidence that what you are
9 doing is buying you a better outcome, particularly, as
10 a psychometrician, we like to say a better outcome in
11 terms of the interpretability of the scores than what
12 you were doing before. Consequences are nice, but the
13 bottom line when you get an assessment is you want to
14 produce interpretable scores.

15 MS. JENNIFER STEGMAN: And this is a
16 question that I'm not sure how because right now our
17 PARCC goes to 2014-2015, and funds after that are not
18 there, but how do you envision the scoring to take
19 place? Are states going to come up with their own
20 automated scoring vendor, and in that case there could
21 be several engines out there that are being used? I
22 have heard that each engine may do something a little
23 bit differently, and, if that happens, how is that
24 going to affect the overall scores and the

1 comparability of those scores for these students?

2 MR. MARK SHERMUS: Imagine a situation where
3 rather than trying to get an exclusive vendor, there
4 is a consortium of vendors. How about that? And they
5 make it their business to look at the comparability of
6 scores along their three or four different engines. I
7 mean, that becomes one of their prime things. They
8 have been unwilling to do that up to this point. This
9 would be sort of a motivational component for them.

10 What you do is the consortium states get
11 together and has one prompt or several prompts that
12 they all buy into. So it is not just a state prompt,
13 but it cuts across multiple states, and there would be
14 enough business to keep these different vendors busy,
15 and all that while they would be developing their own
16 products, maybe in collaboration with one another or
17 in competition with one another, but you can begin to
18 get some progress along those lines.

19 MR. PATRICK ROONEY: If I can go back to
20 Brian's point, and I think Danielle was talking about
21 it: When you are talking about the research agenda
22 and looking for empirical evidence that it is better
23 than the existing system, that strikes me as,
24 obviously, a very good idea, and Danielle was talking

1 a lot about using it as a low stakes, not quite ready
2 for high stakes, and it seems if you are talking about
3 just what currently exists, very few people are using
4 it in a high-stakes manner.

5 So where have you pushed the boundaries to
6 try to -- you know, where are the first pieces that
7 you could try to push it towards high stakes, and push
8 it out to where it works; and then your point, Brian,
9 what are the research studies that you should use when
10 you are going to test to see if it actually works as
11 intended and is actually working better than the
12 multiple choice that it would be replacing?

13 I think those would be helpful and concrete
14 examples of what to find out.

15 MR. BRIAN CLAUSER: Sure.

16 MS. DANIELLE MC NAMARA: One of the things I
17 want to point out is when I was talking about
18 reliability, I wasn't talking about automated scoring.
19 I was talking about human raters. So what we found is
20 that when human raters score things; for example, the
21 quality of the argument or the quality of the
22 conclusion, that's when reliability goes down, and
23 that's our problem. It is not just algorithms that
24 are the problem. It is the raters, and it is not a

1 problem that we can really overcome. You can't stop a
2 rater from thinking. Thinking is making inferences.

3 So the problem is the more that the rater
4 puts into it of their own, and the more we get closer
5 to something that is actually kind of meaningful, the
6 more variance there is.

7 Now, there is absolutely no variance in the
8 algorithm. As we have mentioned before, it comes back
9 with the same score every time. So one of our
10 questions is what is our benchmark, and what is the
11 true answer when you have raters that are all over the
12 place, and it is by no fault of their own and by no
13 fault of hundreds and hundreds and hundreds of hours
14 of training.

15 One of the issues that is related to this in
16 guiding where we want to go is what do you want to
17 see, where do you want to be, what do you want to do;
18 not what you can do, but also keeping in mind what is
19 theory based. So what do you want to assess and how
20 does that align to your theories of what you are
21 assessing.

22 So, for example, when we are assessing
23 comprehension, there are levels of comprehension;
24 text-based comprehension, surface comprehension,

1 situation-model comprehension. Don't throw away the
2 baby with the bath water. Multiple-choice level,
3 multiple-choice questions assess a very valid level of
4 comprehension, their ability to understand some
5 surface-basic features of the test. Then there are
6 text-based questions, et cetera.

7 So there are different types of questions
8 and there are different algorithms that pick up on
9 different things. So when you are developing a
10 system, you can have different types of systems that
11 assess different things, and you need to think about
12 not only what do you want to do, where you want to go,
13 but what kinds of systems will do it better and what
14 kind of variance you can allow in those deeper kinds
15 of questions, where we want to go.

16 We want to go to where we are pushing the
17 envelope, is assessing essay writing, but not only
18 essay writing, the deeper qualities of essay writing,
19 and not only comprehension, but the deeper
20 comprehension.

21 MR. JIM PALMER: I would just like to add
22 that I think multiple-choice items get a bad rap.
23 They are very useful, and the issue really becomes we
24 think some of these performance tasks are really

1 important and really critical. Most of us in our
2 daily lives don't spend our days taking
3 multiple-choice tests. There are times of the year
4 where that is all it is, taking multiple-choice tests,
5 most of the time.

6 So we do a lot of writing and thinking and
7 corresponding. So we think that's an important skill
8 for students to have.

9 So that is really why we are moving this
10 way, is that we think this task is worth highlighting,
11 and putting in the curriculum, and making students
12 work on it. The issue becomes how do you do this very
13 reliably and score it in a manner that yields
14 information back quickly so educators can help
15 students.

16 MR. BRIAN CLAUSER: You asked before about
17 the kind of experiment we would be looking for until
18 now, and this could well be a research agenda that
19 could keep dozens or hundreds or thousands of
20 psychometricians fully employed for generations to
21 come, but the simple answer in terms of like what is
22 the first question I'm going to ask, and this requires
23 some sort of replication -- actually, psychometrics
24 requires replication, but if you have multiple essays

1 that you have scored, and you have multiple-choice
2 items, for example, because that's probably the
3 default if you didn't have the essays, if you have
4 that, you can then ask the question: Well, which
5 score predicts the true score from the essays better,
6 the multiple-choice score or the essay score?

7 And if the answer is that the
8 multiple-choice score predicts the true score from the
9 essays better than the essay score did, then it gets
10 to be a little difficult to say you want to use the
11 essay score if what you are trying to do is report a
12 score.

13 Howard Wagner wrote a paper probably
14 20 years ago with some clever, available doubts toward
15 a Marxist theory of measurement or psychometrics or
16 something like that, that basically asked this
17 question in the context of advanced placement tests,
18 and pretty much most of the time the multiple-choice
19 component measured the other component better than the
20 other component did.

21 We looked at this similarly with our
22 simulation and multiple-choice questions and we got a
23 different answer, but the reason we got a different
24 answer is our tests are incredibly long. So how we

1 allocated the time, we could afford to use an
2 afternoon of simulations because we had a
3 day-and-a-half of multiple-choice questions. If it
4 had been two hours, now how much time do you want to
5 give towards the simulation? The right answer would
6 have been none because the reliability of that part of
7 the test would have been so low that it didn't
8 contribute anything to the overall score.

9 So that's something to think about. The
10 other side of that is we do this, in part, because
11 what we test controls curriculum, and what people
12 learn and how people teach, and that's really
13 important, and we are sensitive to that, too, because
14 when we put on a licensing examination does quite a
15 lot to control what people learn in medical school,
16 and we have institute tests in part to drive
17 education, and not always with the outcome that we
18 intended.

19 You move forward with this, and how you
20 score something really does control what they learn,
21 and it is just kind of a caution in terms of if you
22 think you are doing something because it will have
23 this consequential validity, that is all right, but be
24 very careful to check that it really is having the

1 result that you intended it to have because we have
2 not always had exactly the result we intended when we
3 went down that pathway.

4 MR. DAN LONG: I would just like to follow
5 up with Brian in general in that, Brian, your
6 conversation here is what we have been struggling with
7 for all time. So we really want to know about what
8 students know.

9 We are having a real hard time with our
10 ability to do that, that we have always wanted to know
11 more about. If we are making claims around college
12 and career readiness, and we really want those more
13 authentic assessments, how does AI help us with
14 knowing more about students and how well they really
15 can do? Because I think we can with our
16 multiple-choice questions and some of our constructive
17 response questions, already know what they know.

18 How can we help that? Would anyone else
19 like to take that one up?

20 MR. BRIAN CLAUSER: In a perfect world, I
21 think the process that goes into developing automated
22 systems requires you to pay ever more attention to
23 exactly what it is you are trying to measure, exactly
24 what the criteria are that you are applying to the

1 response that you are evaluating, and at least, in
2 principle, this can do a great deal to help you
3 understand both the cognitive process and how you
4 should be teaching.

5 So I really see it as having potential to
6 advance the whole field of education, in addition to
7 making scoring of complex formats economically
8 efficient.

9 MR. PATRICK ROONEY: Any other questions on
10 that?

11 MR. WES BRUCE: So I guess I get a little
12 concerned about the caution here reflecting not to
13 advertise for large companies, but when you look at
14 the very sort of public results of Watson, it is hard
15 not to think that there is this potential for a quick
16 evolution in what may be possible in terms of scoring
17 some of these items, which takes just one change, as
18 opposed to when we struggle with the platforms on
19 which we are going to deliver this, where we have got
20 to think about getting a device in the hands of almost
21 every student. I mean, that's a very daunting task,
22 as opposed to if there were some dramatic change in
23 the ability to score these very complex tasks,
24 especially those that involve the judgment or

1 argument. Again, that takes us light years.

2 So I would like to have a little bit more
3 reflection on this idea. You didn't call it this, but
4 scaffolding, trying to think about how we scaffold,
5 where we start with where we are, but we can be
6 well-prepared for where we might very quickly be.

7 MR. BRIAN CLAUSER: I just wanted to add one
8 other thing, and I really don't know the answer to
9 that, but I'm sure Mark does, but the thing to
10 remember in terms of Watson, there is no question,
11 probably, that computers are going to advance
12 incredibly over the next 20 years and that we are
13 going to get a whole lot more clever about automated
14 scoring over even shorter periods of time.

15 There is one basic rule that that is not
16 going to fix, which is that a lot of the constructive
17 response items are problematic not because of scoring.
18 Yes, it is a headache to have human scoring because
19 they are so inconsistent, but that's not the problem.
20 The problem is that it takes so long to answer and
21 that we don't want to spend a lot of time with
22 students testing when they should be learning.

23 Maybe the answer to that is what Mark
24 already recommended, which is that the assessment,

1 summative assessment, is really part of the learning
2 activity, and that could be an answer; but to get
3 reliably scores from constructive response items, you
4 need to spend lots of time because you need lots of
5 samples, and it isn't really that we don't know how to
6 score them. It is you need lots of samples that's
7 expensive in terms of student time.

8 MR. MARK SHERMUS: What I would say, again,
9 is go back to the common core standards and let that
10 be the driver. If you want a reliable test, there is
11 no doubt about it, go do a multiple-choice test. It
12 is going to be very reliable, and, for the most part,
13 in most content areas, it is going to give you more
14 information than a performance assessment, a
15 constructive response or an essay. So if that's what
16 your goal is, then just do that, and you are going to
17 be fine.

18 But if you want to know if somebody can
19 reason well, they can write well, or perform a certain
20 set of skills well, then you are going to have to go
21 to some type of performance-type assessment, and I'm
22 going to guarantee you that it is not going to be as
23 reliable, and when you do correlation studies, it is
24 not going to be as valid as the multiple-choice

1 alternatives.

2 The other thing is that we go back to the
3 motivational component: Kids aren't born with a No. 2
4 pencil in their hand and proclivity to choose
5 Option C. It just doesn't work for them. It worked
6 for my generation, and maybe a generation or two after
7 that, but it is not working anymore. You can see that
8 in your statewide test results.

9 So, again, I would simply advise go back to
10 the common core standards, what is it you are trying
11 to squeeze out of that. If it is a performance, try
12 to do a performance assessment. If you can't do the
13 perfect performance assessment, see what the highbred
14 is. I suggested one earlier where you do a
15 combination of a short-answer response and an essay,
16 and until those two components get well-integrated by
17 the vendors, then maybe that's what you do as a bridge
18 to the actual thing that you are really looking for,
19 and that's sort of the conceptual approach.

20 As long as you are consistent with the
21 common core standards of what you are trying to
22 extract, you may not meet some .95 correlation
23 coefficient; it is not going to happen, but at least
24 you are going to be consistent with that goal, and as

1 we get better at it that number is going to go up.

2 MS. SUE LOTTRIDGE: I wanted to respond to
3 the question for the consortia because I'm not
4 understanding one detail, which is did the consortia
5 need to use only automated scoring immediately or is
6 there a transition period where you can field test
7 items, and kind of see what works, and try out
8 automated scoring with some of these items? I mean,
9 is there a plan for this?

10 MR. JOHN JESSE: You have to understand how
11 the consortium is set up. We are funded for one
12 delivery, 2014-2015, and you deliver an assessment
13 delivery system and you deliver the assessment with
14 that. Then funding is over.

15 Funding doesn't allow for the ongoing
16 development or the administration of the assessment.
17 It is for the development of the assessment and the
18 assessment delivery system.

19 So right now we are grappling with what we
20 deliver on 2014-2015, but doing so in a way that sets
21 us up for success beyond those years, knowing that it
22 is not federally funded, but it will be state funded.

23 MR. PATRICK ROONEY: It is worth adding that
24 every state government receives formula funding from

1 the federal government for their statewide system.

2 (Laughter.)

3 MR. JOHN JESSE: Thank you.

4 MS. ANN WHALEN: I think to answer your
5 question, as part of our requirements, we did not say
6 you have to use AI scoring. What we said is to use
7 technology to the extent possible to provide data in
8 an instructional, useful way, try to make sure that we
9 are building into this. It was not that AI had to be
10 done by 2014-2015.

11 Both consortia, as part of their application
12 to the federal government, outlined AI as one of the
13 tools they would use to score their assessment items.
14 So both of them actually did say they would use AI,
15 but also both of them mentioned they would use
16 educators and other forms of practitioners to score
17 items as well, and I believe SMARTER Balanced
18 explicitly talked about the transition potentially as
19 they are working with their adaptive technology, also
20 that period of time as they work with their AI
21 scoring, and I know PARCC is thinking through part of
22 that transition as well.

23 So I don't want people to walk out of this
24 room thinking fall 2014 done. We do see this as an

1 evolving system that the federal government continues
2 to invest in, and we hope the states continue to
3 invest in and improve over time.

4 MS. SUE LOTTRIDGE: Well, in that case, then
5 I think you have the flexibility to start small and
6 build your way up. "Scaffolding" was, I think, the
7 term used. Build items. If they are not automated
8 scorable right now, they may be automated scorable in
9 the future, and deal with what you can right now.
10 Plan for the eventual use of automated scoring, but if
11 there is none, you have to have a backup plan.

12 MR. JOE BLESSING: I have to say this is
13 helpful for me because I think, part of the process, I
14 think we at times were looking at an end date of
15 14-15, and I think this discussion has really opened
16 my eyes to this scaffolding approach that will get us
17 to, I think, something that is valid and reliable
18 right away, and could lead to something that's very
19 cutting edge, I guess. It is very, very helpful for
20 me.

21 MR. PATRICK ROONEY: So does anyone have any
22 final questions before I move on and go back to the
23 Hewlett Foundation idea?

24 No? Okay.

1 MS. ANN WHALEN: I just want to add one
2 thing to what Joe had to say. So I want to say we
3 want to be thoughtful in this transition. I just want
4 to say we have just invested over \$350 million to
5 develop the next generation of assessment systems.

6 So the purpose of the resources are not to
7 reinvent what already exists. So I think separate
8 from kind of -- I think you are right, how do we phase
9 this in, how do we be thoughtful about this. I do
10 want people to see this as an opportunity to think
11 differently about assessment.

12 So multiple choice does have its place, but
13 there is also this desire to think differently about
14 performance tasks, to think through about how do you
15 integrate this more thoughtfully with instruction, as
16 we have talked a lot about today, and AI can be, and
17 has been thought many times, a really useful and
18 helpful way to do that in an integrated fashion, as
19 well as get data back to teachers and parents and
20 students in a way that really helps them inform their
21 instruction throughout their course of the year; not
22 for just, potentially, No Child Left Behind.

23 MR. JOE BLESSING: That was not the intent
24 for the multiple choice.

1 MS. ANN WHALEN: I have to do my PSA.

2 MR. JOHN JESSE: And we need to be realistic
3 about this opportunity. This is a one-time funding,
4 but this is a unique opportunity in our world to make
5 a leap forward and a break free from paradigms of the
6 past, and not to think of it in terms of we will take
7 a little step, and continue to work, and then in ten
8 or fifteen years.

9 This is a unique opportunity. We need to
10 take advantage of it. We need to be bold and step
11 forward knowing this opportunity may not again present
12 itself in our lifetimes.

13 We have this pot of money to encourage
14 states to come together and work in a collaborative
15 effort, and force vendors to think differently and be
16 outside the box, and put them in a different world and
17 encourage them.

18 I mean, this is a great opportunity. I
19 don't want it to be lost through caution and fear. We
20 need to be bold. We need to step forward, and take
21 advantage of this, and move this whole industry
22 forward like it has never been moved before.

23 MR. PATRICK ROONEY: I think that's a good
24 last point to end on. This is definitely, we hope, an

1 opportunity to encourage states to work together, and
2 try things out over the next three-and-a-half years to
3 see if it works, and then hopefully push the envelope.

4 So on that note, helpful note, we will turn
5 it over to Vic and Jason Morgan, and you have
6 15 minutes. I think it has been a long day. So we
7 will try to keep you to that.

8 MR. VIC VUCHIC: In the spirit of taking a
9 bold step, that's what we are trying to get to with
10 this prize concept and help that along.

11 So I'm just going to talk very little about
12 the framing, and then I'll pass it over to Jason to
13 talk a little about prizes, and then we can open it up
14 to conversation.

15 So as we are thinking about this and
16 brainstorming around this prize concept, it is sort of
17 split into two potential tracks. We may actually be
18 open to following both tracks, but one is that the
19 consortia needs something relatively quickly in a
20 short period of time to be able to integrate it and
21 take advantage of these federal funds or whatnot, and
22 hit the 2014 deadline, and that puts a pretty tight
23 timeline on the prize, and in that case it is really
24 kind of focusing more on the technical challenges, are

1 there a few key areas in technical challenges where if
2 we were able to have a few small breakthroughs it
3 could really advance and spark the cycle to grow more
4 broadly.

5 Then in the really innovative brainstorm,
6 there is this bigger thing of certifying and learning,
7 and you think of really creative ideas; peer-to-peer
8 environments, crowd sourcing, all of this which is
9 wonderful to be able to assess, and something we
10 wouldn't consider in the long term, but given kind of
11 the context that we are operating here, it doesn't
12 quite fit into this tight deadline and really tie
13 tightly into supporting both consortia for this
14 effort.

15 I would like to focus the conversation on
16 this kind of technical challenge, 12-month deadline,
17 and try and get information to get us started on this
18 process.

19 So with that I will pass it over to Jason,
20 who is our consultant, and lead, and prize expert that
21 has been helping us out.

22 MR. JASON MORGAN: Okay. Can you hear me?

23 So I caught a red eye from L.A., and I'm
24 just as fatigued as everyone else. So I'm going to

1 try to energize you and get through this quickly.

2 We have a relatively small team. Our team
3 is composed of experts in digital learning assessment
4 and prizes, and we are looking for a lot more
5 expertise.

6 So the purpose of this handout is really to
7 provide contact information. Look through these
8 questions. We are not going to be able to answer them
9 all in 15 minutes, but my contact information is on
10 there. Send answers, send interests, and we will
11 follow up with you.

12 If I'm the prize guy, then who am I, right?
13 Well, I used to develop prizes for the Xbox
14 Foundation. In 2006, I set up a center at MIT to
15 study incentives to induce new technologies, changes
16 in product development, changes in social behavior,
17 and following that I spent about five years developing
18 prizes in the Middle East, the UK, and now in the US.

19 When I was at MIT, we wrote a paper on which
20 we tried to lay out what the prize landscape looks
21 like, and if you can think of it in themes, the
22 strongest notion today is this idea of the bounty or
23 the reward. You put up X amount of dollars for
24 something that has never been done before and you

1 reward that behavior when the breakthrough occurs.
2 The more common notion is the idea of the Lifetime
3 Achievement Award, right? The Nobel Prize. You know
4 about the prize, achievement. We are not ruling out
5 either one of those, but for the purpose of this
6 conversation we are going to focus on introducing some
7 new breakthrough.

8 Similarly, you can cut the landscape a
9 different way. You can talk about introducing new
10 ideas versus new proofs of concept. So these are two
11 interacting axes. We are looking at a prize that can
12 induce a big breakthrough that can actually be
13 demonstrated against some data set.

14 I already said I'm not an expert in
15 automated assessment, but I do want to recognize
16 something that I heard today. There is this notion of
17 kind of the formative assessment model, and I'm kind
18 of grabbing for terminology here, and then the
19 summative assessment model, and we have members of our
20 team who would very much like to push the prize
21 towards formative assessment.

22 Mark earlier talked about the idea of kind
23 of the video game in a formative assessment where you
24 learn as you go. Another analogy is kind of the army

1 training obstacle course where you are watching
2 somebody as they go through the obstacle course. The
3 purpose is to gain skills as they participate in the
4 test, not just to measure the time they took to
5 complete it.

6 For the purpose of this conversation, we are
7 setting aside formative and we are looking at
8 summative, and there is a reason for that. It really
9 gets to our goal, which is adoption of the consortia
10 and adoption of the states. So the exercise here is
11 really in achieving something that is audacious and
12 bold, but also achievable and they can drop into the
13 system.

14 So when we think of that, in those terms, we
15 need to be sensitive to kind of the current conditions
16 that are out there, and a lot of the questions that
17 you will see on here try to work towards answering
18 questions about kind of what does the marketplace look
19 like today, and then, secondly, understand what the
20 framework is that we are going to attach to it.

21 If the answer requires deep-freeze storage
22 of a super computer, clearly we cannot do that. So we
23 need to think about these things in advance, and I
24 will break out these questions into themes, and we can

1 either talk about them or you can consider my themes
2 and you can send me an e-mail with an answer to that.

3 You know, the price sensitivity,
4 performance, all of these things are factors. If I
5 had my druthers, what I would say is let them be
6 audacious, but achievable. Let's talk about how we
7 are going to measure against the current standard,
8 right?

9 So if you can think of an idea of a Turing
10 test, one in which we are saying that the system has
11 to match what a known panel of experts would achieve,
12 that could be a benchmark for us; but, second, and
13 probably even as important, we need to think about
14 price sensitivity, right? Because the states are
15 going to adopt this if this is cost effective.

16 So if we are going to measure this tool in
17 any way, it needs to, A, work as well as a panel of
18 experts, and that may not be a gold standard, but it
19 is a well-known standard; B, it needs to be cost
20 effective so the states will adopt it; and then, C,
21 there are other constraints that these school
22 districts have that we need to lay out.

23 Anyway, that's my lead-in. My intentions
24 now are to go through some of these questions, and

1 talk about why they are important during this stage,
2 and then to ask you to answer them or at least inform
3 us.

4 The thing about prizes or at least these
5 kinds of prizes is they really work best when we have
6 recognized that there is some market failure that's
7 occurring, right? There is not enough money, or mind
8 share or talent, or some other form of investment
9 that's flowing into these sectors, and therefore no
10 solution has occurred, and you think of those first
11 two questions on this sheet, and you say: "Here what
12 we are trying to do is define what the market
13 conditions are." That becomes very critical,
14 especially when you start considering how much of a
15 reward are we going to put out there.

16 So the question specifically is what are the
17 current drivers for individuals or companies that are
18 already investing in this space, right? And,
19 similarly, what potential reward could attract new
20 talent and investment against the current known
21 conditions? In other words, I'm asking you why hasn't
22 this happened yet, right, and who is trying to make it
23 work, and is that enough?

24 Now, I don't believe we had enough people

1 from, maybe, private industry here at this table
2 today, but I would like to know from your impressions,
3 having worked with vendors, what do you think? Do we
4 have enough talent going into this space? If not,
5 why, and what new rewards could we use to attract new
6 talent? I think that's a good leaping-off point, and
7 we have five more minutes. We have 12 more questions,
8 but I think I would like to hear what you think.

9 MS. ANN WHALEN: Can I just ask you to
10 literally, for one minute, explain your comments with
11 the prize? I'm not sure everyone in this room
12 understands what the prize competition means for
13 purposes of this discussion.

14 MR. JASON MORGAN: Sure.

15 There is many different types. They tend to
16 achieve many different things, and there are risk
17 factors associated with each one. So a common prize,
18 probably the most well-known, is the Lifetime
19 Achievement Award. You are giving someone a reward
20 for what they have already done, and that makes up the
21 majority of the prizes that are out there.

22 We did a study with McKenzie in 2006, and it
23 was published in 2009, in which we looked at the full
24 landscape, and we noticed the growth in the prize

1 sector is toward the ex ante law, which is where you
2 are rewarding for something that has never been done
3 before. Over the last decade, we were seeing about
4 18 percent growth per year in this prize technology.

5 So you put up a big cash award, and it has
6 never been done before, and someone has either a
7 demonstrable proof of some technology or maybe they
8 are just yielding an idea that has never been applied
9 before.

10 So I think those are two kinds of polar
11 opposites, and I can attach more trend analysis to all
12 that, but that's kind of where I would stop given the
13 amount of time that we have, and I would just say that
14 we are focusing for this discussion on the ex ante
15 model. We are going to put up money. We are going to
16 use that to leverage and to induce new mind share, new
17 talent and investment, to get more people focused on
18 this problem, which begs the question: How much money
19 is out there? What is the size of the marketplace?
20 What are the follow-on opportunities?

21 If someone makes the investment to win this
22 prize, how much are they going to have to invest?
23 Once they have done it, what's the potential beyond
24 some cash award? Are we going to open up new markets?

1 How can an AI scoring apply to a larger marketplace?

2 We have kind of worked around some of these
3 questions, but that's at the core of what we have to
4 do in developing feasibility.

5 MS. ANN WHALEN: Thank you.

6 MR. JASON MORGAN: So how big is the
7 marketplace we are talking about here? How much does
8 it take a company like Pacific to develop a solution
9 over a specific course of time?

10 MR. HOWARD MITZEL: Are you asking?

11 MR. JASON MORGAN: Yes.

12 MR. HOWARD MITZEL: Could you restate the
13 question, please?

14 MR. JASON MORGAN: I will try to simplify
15 it.

16 How much does it cost you to develop a
17 product that is desirable by your client in automated
18 scoring?

19 MR. HOWARD MITZEL: Well, the investment
20 levels are actually proprietary information, but it is
21 multiple millions.

22 MR. JASON MORGAN: That's great. That's
23 fine.

24 And how big of a market do you see out

1 there? If the market is \$2 billion, and you have X
2 market share, clearly you're investing this money
3 because you see larger opportunities, right?

4 MR. HOWARD MITZEL: The problem has been
5 technology limitations out in the states, and we have
6 not been able to collect the data. This field, I'm
7 sorry to say, is more empirically driven than it is
8 theoretically driven.

9 MR. JASON MORGAN: You mentioned the states.
10 Are the states your clients in this instance or are
11 there other people you are appealing to? Could we
12 define the marketplace here as this is something that
13 the states are your target base?

14 MR. HOWARD MITZEL: I think we are all state
15 assessment at the moment. I can't think of another
16 area, but in this general area there is a lot of
17 people very interested.

18 MR. JASON MORGAN: And you feel this is a
19 competitive sector that you are in? Are there a lot
20 of other people doing what you are doing?

21 MR. HOWARD MITZEL: It is a killer
22 competitive sector, especially for small companies.

23 MR. JASON MORGAN: It is the end of the day.
24 So I'm trying to move the conversation forward.

1 So we have got a challenge here, what are
2 the market conditions, do we set up a prize that
3 outstrips other incentives or not, and that's what we
4 need to go through to determine feasibility here.

5 If it costs you \$2 million to develop a
6 product, and we put out \$100,000 for a prize, clearly
7 that won't attract attention. So we need to consider
8 these things.

9 Secondly, kind of the idea of what are the
10 other needs of product developers like yourself? That
11 gets us to our next three questions: What are the
12 leading indicators of improvement in your marketplace,
13 Howard? We talked about speed, cost effectiveness.
14 If you are going to try to drive towards more
15 innovation, and you have a limited amount of
16 resources, are you looking to increase effectiveness
17 or cost effectiveness?

18 MR. HOWARD MITZEL: Both. The cost
19 effectiveness is in the high-end labor that we have to
20 use now around this to support it, and that includes
21 the monitoring and enhancement costs, too.

22 MR. JASON MORGAN: So in terms of your
23 clients' preferences, have you reached a point of
24 which effectiveness in terms of automated assessment

1 is kind of you're trying to differentiate from your
2 competitors, and that's a goal, but where do you make
3 the most difference? Is it in pricing?

4 MR. HOWARD MITZEL: It is in fast
5 turnaround. We do high-stakes turnaround in two days.

6 MR. JASON MORGAN: So speed?

7 MR. HOWARD MITZEL: Speed. That's what they
8 want now.

9 MR. MARK SHERMUS: Can I just jump in?

10 The first question, and I think I'm correct,
11 but I think Kansas is the only state that has the
12 capacity to do totally automated scoring. So you have
13 sort of the chicken-and-egg kind of issue here.

14 The capacity or the demand would be
15 incredible if the states were geared up to handle the
16 technology that we are talking about. I used to be in
17 Florida, and maybe 30 percent of the school districts
18 there were really reasonably well-distributed with
19 technology where they approximated like one computer
20 for every two kids, but then there are rural districts
21 in that state where you have three computers in the
22 entire school. So the demand would be tremendous if
23 the market conditions warranted it.

24 MR. JASON MORGAN: I agree with you, and it

1 gets to a point that John made earlier.
2 Unfortunately, in the situation you are in right now,
3 the consortia or the states really have to make a bet.
4 They have to pick a product and make a bet, and what
5 I'm saying is in this model what we would do is we
6 would set a standard, and then we would set the
7 criteria for the winner in this case, and then we
8 would leverage other investment, other people that
9 would develop products, posted on our specific
10 criteria, and then we would get to choose that winner.
11 That's kind of a pull strategy instead of a push
12 strategy. That's a much different way of doing
13 things.

14 I agree with you it sounds like
15 a chicken-and-egg thing if only Kansas is doing this,
16 but I think that the fundamental model is what we are
17 trying to get to.

18 MR. ALAN SHEINKER: Kansas, if you are
19 talking about testing online, we had 99.7 percent that
20 were assessed online. I think that's what you are
21 alluding to in terms of the capacity.

22 (Inaudible speaker.)

23 MS. ANN WHALEN: I know we are running
24 quickly out of time.

1 Thinking of a fast way to get you
2 information on these questions, and it seems to me
3 another question is, to get the states up and working,
4 is what solution do you guys need that doesn't
5 currently exist, that you can't get people to respond
6 to in this space as well; not necessarily what the
7 vendors think they can do, too, but what's the best
8 way to get you guys follow-up?

9 MR. JASON MORGAN: All the questions are
10 here. Our contact information is here. Please take a
11 sheet.

12 To get to credibility and more precision, we
13 need more people to participate as advisors. So over
14 the next four to six weeks, we are going to be hosting
15 Webinars and conducting interviews.

16 MS. ANN WHALEN: And are you guys
17 comfortable with us posting this on our Website as
18 part of this conversation so you may get additional
19 feedback?

20 MR. VIC VUCHIC: Yes, contact him.

21 MR. JASON MORGAN: Wait a minute.

22 MR. VIC VUCHIC: And if you have answers to
23 the questions or you know of experts, invite people to
24 that. That information is absolutely critical.

1 MR. PATRICK ROONEY: Thank you, Vic and
2 Jason, for that. Thank you everyone in the audience
3 for bearing with us.

4 We do have four people who signed up to give
5 public comments. So I will repeat again for everyone:
6 The purpose is for you to add comments, thoughts,
7 suggestions, ideas for the consortia to consider as
8 they are moving forward with automated scoring.

9 They are not going to respond to any
10 questions right now, but certainly if you can help
11 them with their thinking as they take the information
12 back from today's meeting, that would be wonderful.

13 So we will just go in order with the four
14 people. You each have three minutes, again, and, once
15 again, the timer is up there on the left-hand side,
16 and yellow means you have one minute left, and when it
17 gets to red, you have zero left.

18 If you have any additional comments you want
19 to make, or anyone who didn't sign up, but wants to
20 provide comments, we would love any written comments
21 you have. The e-mail address is
22 racetothetop.assessment@ed.gov.

23 With that, we have Ed Schlitt, David
24 Williamson, Julie Woestehoff and Sharnell Jackson.

1 We will go right in order. If you guys
2 could get yourselves ready; the second, the third, and
3 fourth person.

4 Ed, you are first.

5 MR. ED SCHLITT: Hello. I am from the
6 Learning Disabilities Association of America, and
7 thank you today for a very comprehensive presentation
8 that you gave us.

9 LDA asked me if I would come to this open
10 forum today because my background in education, first
11 as an educator, and then as a diagnostic consultant.
12 I have some experience as a facilitator working at the
13 state level with Reading First, and then with a highly
14 technically-driven Read 180 program for a few years
15 that was a great experience.

16 In that, through that journey of mine, it
17 has come to my attention that there is much great
18 information that I was able to learn from students,
19 whether it was in the very one-on-one testing
20 situation or whether it was through some pretty
21 sophisticated technology programs that were able to
22 measure a lot of student information.

23 With that information, however, many times
24 that information was brought back to an infrastructure

1 that was not prepared to deal with the information
2 that we were giving them, whether we were giving them
3 information on a handicapping situation or a student
4 that was below grade level, and I know that this is
5 kind of a rhetorical question for this group or
6 problem, but what is it that we are doing for those
7 students that are significantly below grade level?

8 We know that there are students that are not
9 responding because of neurological impairments, and
10 this is certainly going to slow their process. We
11 also know that there is a large number of students
12 that are not responding for other reasons, whether it
13 is ELL, whether it is instructional, and many other
14 reasons. We have large numbers of students that are
15 not responding, which is certainly a concern of ours.

16 We are hoping that, as you move forward with
17 the automated scoring, that you will embed this in a
18 structure that is prepared to accept this for how you
19 intended it so that we can get the best results and
20 then begin to start remediating and offering
21 interventions for students that are most appropriate.

22 Thank you.

23 MS. ANN WHALEN: Thank you.

24 MR. PATRICK ROONEY: Thank you.

1 David Williamson again.

2 MR. DAVID WILLIAMSON: I'm back, and I'm
3 unscripted. So I will watch the clock here.

4 I just want to touch on a couple of things
5 in the discussion here today. One of the things that
6 was alluded to in part of the discussion here earlier,
7 but has been a curiosity of mine for some time, maybe
8 this will present opportunities to be able to explore
9 in some capacity, and that is that when we talk about
10 some of these products, many of them are propriety.
11 They have been developed independently of each other,
12 even though they have some aspects that might be
13 somewhat in common in the processing, but we have
14 heard there is some expression of concern or
15 uncertainty about their performance alone in the
16 absence of human evaluation along with them. There is
17 also a concern about how do we address the small
18 proportion, say 5 or 10 percent of cases, that are
19 unusual or different in some way that the engines
20 might not handle as well as we would want them to.

21 If we are fortunate because these are
22 separately developed systems, perhaps the space of the
23 10 or 5 percent of concern are non-overlapping in some
24 way. So that two engines in conjunction might cover

1 the full space or close to it to give us more
2 confidence. I think these kinds of things are not
3 particularly likely because they are coming from a
4 common field, but it is something that might be worth
5 exploring as part of the evaluation.

6 Another thing, it is unfortunate Danielle is
7 not here because I was very curious about some
8 comments she made about what she referred as to the
9 non-corpus based model. I think we have been
10 referring to it as a generic model where there is one
11 model in this design to score multiple prompts, even
12 if the prompt wasn't particularly designed for that
13 model. So this is one model that was worked once and
14 used many times.

15 In our experiences with those generic
16 models, there is some corpus-based evaluation in
17 establishing the first version of that model, but as
18 for future prompts that are generated in a similar
19 fashion, we have been able to score those successfully
20 without having to re-calibrate or produce new corpus.

21 Now, what she might be referring to is that
22 she was using it in dealing with content. In cases
23 where we are looking at content, specific content for
24 that prompt had not worked. We don't have generic,

1 prompt-based scoring for content. So I thought that
2 might be something worth exploring as well.

3 Thank you.

4 MR. PATRICK ROONEY: Thanks.

5 The next is Julie Woestehoff.

6 I'm sorry. I should have asked each of the
7 commentators to say your name and also your
8 affiliation, if possible, before you start.

9 MS. JULIE WOESTEHOFF: Good afternoon. I'm
10 Julie Woestehoff. I'm the executive director of
11 Parents United for Responsible Education, which is a
12 24-year-old parent advocacy group here in Chicago.
13 I'm also the cofounder of Parents Across America, and
14 I'm here representing both groups.

15 This is not going to be about computer
16 scoring of testing. Parents can't get to every one of
17 these hearings. So when we get an opportunity to
18 speak to you all, we want to tell you what's really on
19 our minds.

20 What I want to talk about quickly is about
21 what is happening in Chicago this week. Parents are
22 getting letters from the system saying that their
23 children are going to be held back, and a lot of
24 parents are surprised because they haven't heard

1 anything throughout the year about their child having
2 trouble in school, and I have to tell them: "Well,
3 that's because the policy of the system is that when
4 they get the ISAT scores back, the state test scores,
5 they make that decision based on that score."

6 PURE has been fighting this policy since
7 1999. We recently just filed a new complaint, a
8 discrimination complaint with the Office for Civil
9 Rights, about the policy, and we are waiting to see
10 what is happening with that investigation, and I
11 mention this today because this is one of the many
12 inevitable results of the misuse and overemphasis on
13 standardized tests in the United States, and I also
14 know that there is similar situations going on
15 everywhere such as the recent institution of 52 new
16 standardized tests in the Charlotte-Mecklenburg school
17 system. It is insanity, yet we sit here talking about
18 national standardized tests.

19 If we think things are bad for our children
20 now, just wait until standardized testing goes
21 national and those test scores are used to decide
22 teachers' salaries and jobs and which schools will be
23 closed. Parents are saying no to more testing.

24 We are being told that we don't need to

1 worry about these tests because they are going to be
2 better, and I think that's what you are telling us
3 today. I don't really believe that, and I don't think
4 I'm alone in my skepticism.

5 In fact, I read the 2011 guide that was
6 prepared by the Educational Testing Service, and what
7 I read in there raised more questions in my mind than
8 it gave answers, and there are many, many questions I
9 heard today as well: You know, people wanting to know
10 what the questions are. We don't even know what the
11 questions are.

12 Meanwhile, plans are being made
13 state-by-state and district-by-district for more and
14 higher stakes to be tested because they are going to
15 be better under the new federal education law.

16 You talk about results, challenges, and
17 frankly I don't hear anything in there about concern
18 for children in all of that.

19 So in addition to just that issue, there are
20 many other concerns about standardized testing that
21 parents have. One is excess reliance on standardized
22 exams mirrors the curriculum and promotes teaching to
23 the test. In fact, here in Illinois there is a whole
24 set of assessment standards, and on the Website it

1 says: "These are things that are testable, but don't
2 use that as your curriculum," and yet that's what
3 happens.

4 Again, too many districts are falsely
5 claiming they are using multiple measures when they
6 are doing no such thing. That's what is happening in
7 Chicago. The promotion policy talks about multiple
8 measures, but it is actually multiple barriers.

9 Similarly, officials have begun to refer to
10 certain quarterly or other regular standards-based
11 tests as a formative assessment, when, in fact, they
12 are nothing more than fast attempts for annual
13 summative databank tests.

14 Thirdly, standardized tests may be biased,
15 and they definitely had a disparate impact in Chicago,
16 which is why we filed our complaint.

17 The research linking teacher performance
18 evaluation and jobs to student test scores is
19 overwhelmingly negative, and yet we seem to be moving
20 ahead and doing that as well.

21 And, finally, implementing the next
22 generation of tests is no doubt going to be hugely
23 expensive at a time when schools are already facing
24 severe cutbacks of educational necessities and raising

1 class sizes to unworkable numbers.

2 Now, I know you said you wouldn't answer any
3 questions, but I have a couple questions right now.
4 One is how much are these tests going to cost, and has
5 there been an estimate made, and what is that
6 estimate; and, secondly, how will you keep states and
7 districts from doing what Chicago has been doing, and
8 what is happening around the country, and that is
9 misusing the tests and using them improperly in ways
10 that actually damage children?

11 And I would love to get some answers,
12 whether here or online.

13 MS. ANN WHALEN: Thank you.

14 MS. JULIE WOESTEHOFF: Would I be able to?

15 MS. ANN WHALEN: You are welcome to write in
16 to our e-mail address. Yes. Thank you.

17 MR. PATRICK ROONEY: Thank you.

18 And the last comment is Sharnell Jackson.

19 MS. SHARNELL JACKSON: I am Sharnell
20 Jackson, a retired teacher, and in the eLearning
21 office for the Chicago Public Schools, and currently I
22 am president of Data-Driven Innovations Consulting.

23 I just recently co-authored a publication on
24 data use for the U.S. Department of Education IES, and

1 I want to say that I was really encouraged by the
2 statement around formative assessment and the
3 potential for using that, and I want to encourage you
4 because, as a classroom teacher, my students were
5 number one in the state for reading, writing, and
6 mathematics, and it was because of formative
7 assessment and using those multiple measures of
8 performance-based assessment that really mattered
9 most.

10 Summative assessments, we look at that as
11 primarily dead on arrival. It comes at the end of the
12 year. It doesn't give any high-informed practices,
13 best teacher practices, nor does it inform in giving
14 instructive feedback to students in order to improve.

15 So what I want to do is encourage you about
16 formative assessment and informing in the
17 instructional process. People think that formative
18 assessment is a tool. It is a process under which you
19 inform teaching and learning, and I want to talk about
20 PD, and the use of data, and how very important that
21 is about process and protocols around using that kind
22 of information, multiple measures of assessment, to
23 inform the teaching and learning process.

24 Research best practices, which are valid and

1 reliable means of looking at what has been working and
2 what hasn't been. Student motivation, give them
3 constructive feedback so that they know specifically
4 what they need to do to improve and learn from
5 mistakes.

6 So performance-based assessments such as,
7 and I want to mention this, gaming and social
8 networking, how are students today now learning, and
9 how can we take that and apply that to exactly what we
10 want them to do? But doing that on a quarterly basis,
11 rather than at the end of the year as a high-stakes
12 assessment where everybody is teaching to the test.

13 So if you give a summative assessment at the
14 end of the year, what is going to end up happening is
15 everybody is going to be teaching to the test because
16 the stakes are even higher now.

17 So predictive analytics tells us what is
18 working and what isn't and giving us some indications
19 with reports to show growth.

20 Strengths and weaknesses, I want to talk
21 about summative assessment, and using it as a scaffold
22 learning process, and giving it on a quarterly basis.

23 The last piece I want to mention is about
24 the technology. I know probably more than most about

1 technology as it relates to education, and I want to
2 talk about the IMS Global Learning Consortium, the
3 Common Cartridge and Learning Tools Interoperability
4 Alliance. There have been a number of publishers that
5 have been working on learning management systems and
6 providers who have been working on this for ten years.
7 There are numerous. I think they cover mostly all 50
8 states as well as an enormous amount of vendors that
9 have been part of this process.

10 I would say look at them and what they are
11 doing, and what they have been able to achieve so far,
12 because you want modular components that you can plug
13 in that are interoperable, and it is really important
14 because not one tool is going to be a solution for
15 informing teaching and learning. So look at that as
16 an indicator.

17 Then also last, but not least, Comcast is
18 providing computers and broadband access to students
19 with free and reduced lunch, low-income students
20 throughout the State of Illinois, starting in Chicago
21 with our new Mayor Rahm Emanuel, and that is a way of
22 providing broadband access with a computer to give
23 these students the kind of tools that they need for
24 learning.

1 And that's it. Thank you.

2 MR. PATRICK ROONEY: Thank you.

3 All right. Now we are going to end with a
4 round off.

5 MS. ANN WHALEN: First, I just wanted to
6 thank everybody here today. It was a really rich and
7 thoughtful conversation, and I know for some of us it
8 is a pretty weak topic area, and we appreciate the
9 experts and the members of the consortia to give up
10 their day, especially this time of year.

11 We really appreciate it and are really
12 thankful to all you guys for helping educate us in
13 this area and help pose some of these questions that I
14 know we are going to be dealing with not just over the
15 next few weeks or few months, but over the next many
16 years as we really continue to form this next
17 generation of assessments and also to form what
18 happens in the classroom as well.

19 I would like to acknowledge that since we
20 were talking about such a very specific area, these
21 comments are just one of many conversations happening
22 around these topics, not just that we are hosting
23 public meetings on, but that the consortia are getting
24 together on and other national and local organizations

1 are meeting together on.

2 So I wanted to just highlight that this is
3 part of a breadth of a larger discourse that is really
4 happening across the nation and how truly exciting
5 that is. As John had said, this is an amazing point
6 in time and a true opportunity for us to really think
7 differently about.

8 I also just wanted to take a moment and
9 actually thank those that traveled here today to
10 Chicago, or Oak Brook, especially with this weather,
11 and, again, to the experts who gave their time.

12 (Applause.)

13 Just one last final reminder: I know we
14 weren't able to give copies of the PowerPoint out to
15 the public audience. If you are interested in getting
16 copies of the PowerPoint used, they will be available
17 on the U.S. Department of Education Website starting
18 early next week. So we should have at least the
19 PowerPoint presentation up. It will take longer to
20 get the transcript out to everybody, but we will get
21 that out very soon.

22 Another reminder, as I mentioned at the top
23 of the meeting, we will be holding our third in these
24 series of public meetings scheduled for August 10th in

1 Washington, D.C., and that meeting will be on the
2 inclusion of students with disabilities and English
3 language learners, the next generation for the
4 government presentation. Information on that meeting
5 will be available on our Website and another e-mail
6 will go out to our listserv for those interested in
7 learning more about those details.

8 Finally, we continue to welcome any public
9 input that those of you may have on the Race to the
10 Top Assessment Program. Again, our e-mail address is
11 racetothetop.assessment@ed.gov.

12 Thank you all very much. Have a wonderful
13 afternoon and a safe trip.

14 (WHEREUPON, the meeting was adjourned at
15 3:22 p.m.)

16

17

18

19

20

21

22

23

24

1 CERTIFICATE OF COURT REPORTER

2

3 I, HEATHER PERKINS, the officer before whom foregoing
4 hearing was taken, do hereby certify that the
5 testimony in the foregoing hearing was taken by me in
6 stenotype and thereafter reduced to typewriting; that
7 said hearing is a true record of the testimony given;
8 that I am neither counsel for, related to, nor
9 employed by any of the parties to the action in which
10 this hearing was taken; and, further, that I am not a
11 relative or employee of any counsel or attorney
12 employed by the parties hereto, nor financially or
13 otherwise interested in the outcome of this action.

14

15

16

17

18

19

20

HEATHER PERKINS

21

COURT REPORTER IN AND FOR

22

THE STATE OF ILLINOIS

23

24

<hr/> \$ <hr/>	216:7	139:17	7 69:6 138:12
\$100,000 206:6	1's 34:11	3:22 225:15	70 110:4,7
\$2 205:1 206:5	<hr/>	30 13:14 65:7	75 22:9,17,22
\$3 95:18	<hr/> 2 <hr/>	207:17	<hr/>
\$350 193:4	2 119:7 138:13	300 33:19 49:13	<hr/> 8 <hr/>
<hr/>	139:17 147:7	300,000-plus	8 4:2 47:15 83:20
<hr/> 0 <hr/>	189:3	55:11	8,000 30:5
0 68:19 69:21	2,500 54:14	36 122:1	80 69:20 76:12
01 69:24	2-.5 139:17	3-for-1 106:12	80s 30:21
<hr/>	20 43:2 65:7	3-to-1 56:21	85 76:12
<hr/> 1 <hr/>	106:22 126:2	<hr/>	<hr/> 9 <hr/>
1 34:10 60:23	128:10 183:14	<hr/> 4 <hr/>	9 55:8 60:23
68:19 69:24	187:12	4 119:19 138:8	9:00 1:11
119:2 138:8	200 34:2	4-.5 139:17	90 22:9 30:23
1:00 127:1,2	2000s 31:6	40 90:4 145:10,11	9000 42:14
10 1:12,15 65:7	2006 197:14	45 4:11 6:8 16:14	90s 31:6
213:18,23	202:22	97:15	95 36:20 37:10
10:30 5:21	2008 118:13	<hr/>	189:22
100,000 55:15	2009 49:9 118:15	<hr/> 5 <hr/>	98 26:16
10th 2:6 224:24	202:23	5 39:17,18 58:17	99.7 77:10 208:19
11 55:5 104:20	2011 1:12 118:17	106:22 122:22	<hr/>
107:19	174:2 175:4,7	147:8 213:18,23	<hr/> A <hr/>
12 89:9,11 202:7	217:5	5.5 58:17	a.m 1:11
12:15 6:2	2012 176:7	5-.6 139:16	abilities 4:5
120 16:18	2013 176:7	50 22:9,17	ability 27:24 29:1
12-month 196:16	2014 174:5,9,16	113:15,16 222:7	34:24 58:22 60:8
13,000 54:15	175:5 191:24	50,000 113:16	71:6 82:16
13-14 19:10	195:22	500 33:18 36:15	92:3,4 93:14
14-15 19:1 192:15	2014-15 3:24	52 216:15	104:3 109:22
1492 29:7	2014-2015 25:3	55 69:21	119:5 136:18
15 20:16 43:2 99:8	117:7 177:17	<hr/>	162:12 173:13
122:3 123:5,6	190:12,20	<hr/> 6 <hr/>	181:4 185:10
128:14 129:16	191:10	6 23:19 34:10	186:23
131:1 146:2,3	2015 25:4	39:18 83:18	able 2:11,18 3:21
195:6 197:9	2020 174:6,16	6+1 32:10 46:4	18:6 19:2 21:13
15-minute 5:21	2025 174:7,9	60 16:14 64:20	37:7 38:5 42:19
16 59:12	23rd 147:14	64 168:24	43:6,10,11,12,15
16-week 146:16	24 69:7	64s 166:8	44:17 55:19
18 203:4	24-year-old	65-year-old 54:3	56:4,6 59:10
180 211:14	215:12	69 69:7	72:18 76:5 77:17
1983 166:7	25 22:9,17 53:23	6-point 147:8	78:12 79:21
1985 166:1	103:19	6's 34:11	85:14 87:3 100:5
1997 118:5	<hr/>	<hr/>	101:1 105:24
1999 53:3 118:10	<hr/> 3 <hr/>	<hr/> 7 <hr/>	113:4,8 122:13
	3 4:1 47:15 95:10		123:22,23
	104:20 119:13		125:11 155:9
			156:22 157:17

161:10 162:10,11 174:12 195:20 196:2,9 197:8 205:6 211:18,21 213:8 214:19 219:14 222:11 224:14 absence 213:16 absolutely 47:19 49:14 85:10 116:22 180:7 209:24 abstract 65:24 Academy 120:19 121:22 accept 212:18 acceptable 139:20,21 153:18 acceptance 13:8,9 153:14 161:19 accepting 7:24 access 14:10 21:14 93:14 145:18 222:18,22 accessibility 23:12 50:4 124:7,9 accessible 124:5 accidentally 132:15 accommodations 24:4 accomplish 30:7 75:10 accomplished 26:23 accordingly 153:8 account 95:18 accountability 17:16 21:20 22:1 147:21 accountable 21:21,22,23,24 accounted 30:17 accuracy 51:23 85:1 102:3	111:11 113:9 139:14 148:12 accurate 3:10 36:14 46:9 47:13,16 77:11 85:10 138:15 accurately 4:6 101:2 achievable 199:12 200:6 achieve 25:9 200:11 202:16 222:11 achievement 198:3,4 202:19 achieving 199:11 acknowledge 223:19 acquiring 162:22 across 4:18 12:3 22:8 30:23 49:17 58:1 65:7 97:21 98:7 108:23 109:13,15 110:4,5 160:23 165:23 178:13 215:13 224:4 ACT 122:11 action 12:15 110:5 140:15 226:9,13 actionable 14:20 actions 53:21 54:14,16 active 49:18 136:12 activities 72:20 activity 169:23 188:2 actual 5:10 85:24 112:4,20 122:4 138:17 146:13 159:8 189:18 actually 2:5 7:18 12:4,24 14:14 26:11,18 27:17 28:11 30:7 33:1 38:20 39:12,22 41:12 44:14	45:17 46:14 49:1 52:15 56:3 62:4 72:12 74:4 75:16 76:6,21,23 77:4,5,8 78:12,23 79:5,8,24 86:11,12,16 88:11 92:16 93:5 95:21 98:23 99:19 100:5 102:1 108:5 112:8,9,12,23 113:20 115:12,23 124:9 125:1 127:9 130:19 131:11 146:24 148:12,23 150:1 151:16 152:1 161:4 168:12 169:24 171:10 172:21 179:10,11 180:5 182:23 191:14 195:17 198:12 204:20 218:8 219:10 224:9 adapted 84:10 adapter 87:15 adapting 84:14 adaptive 14:23 16:4,24 17:6,15 18:10 81:21 82:1 83:5 84:19 86:11,24 87:6,11 93:6 155:16 162:6,7 191:19 add 36:5 60:17 82:10,12 84:6 96:20 109:7 111:22,24 148:14 176:4 181:21 187:7 193:1 210:6 adding 42:24 101:16 190:23 addition 186:6 217:19 additional 2:9 6:17 7:7,8 8:8,12 9:2 26:4 35:22	86:22 114:7 209:18 210:18 Additionally 3:20 add-on 149:21 add-ons 92:23 address 8:2 76:2 92:4 93:21 210:21 213:17 219:16 225:10 adhering 13:24 adjacent 30:22 adjourn 126:20 adjourned 225:14 adjustments 34:6 administer 4:20 18:2 91:9 123:17 administered 58:10 146:14 administering 12:12 19:5 administration 23:15,18 82:2 160:24 190:16 administrations 146:23 administrators 24:12 Admission 118:10 admissions 118:12,14 adolescents 63:13 adopt 200:15,20 adoption 199:9,10 advance 54:8,23 55:1 125:9 186:6 187:11 196:3 199:23 advanced 75:24 183:17 advances 5:3 21:18 71:4 advantage 59:11 79:5 92:8 132:16 170:9,13 172:14 194:10,21 195:21
--	--	---	---

advantageous 116:13	30:22,23 32:6,14 48:11,15 51:5 119:9,15 169:21	156:8,9	64:24 65:1,21 67:19,20,22 71:20,23 203:11
advantages 94:5 147:10 150:14	agreements 30:20	alluded 44:21 213:6	analytically 31:24
advertise 186:13	ahead 41:5 74:18 88:14 93:18 104:13 127:6 218:20	alluding 208:21	analytics 221:17
advertising 90:10	AI 37:14 89:10,12,20 91:10,21,24 94:24 97:4 109:6 163:6 167:6 185:13 191:6,9,12,14,20 193:16 204:1	alone 71:8 114:19 137:14 213:15 217:4	analyze 73:14 141:3
advice 173:21	akin 48:11	already 2:5 6:7 8:16 65:6 123:20 131:13 158:3 167:10 171:10 185:17 187:24 193:7 198:14 201:18 202:20 218:23	analyzed 122:5
advise 163:15 189:9	Akron 10:12 25:18	alternative 137:5	analyzes 64:18 65:1
advisor 97:23	Alan 9:17 38:24 39:1 40:15,24 208:18	alternatives 30:13 68:13 71:4 147:1 189:1	anchor 83:11
advisors 209:13	algebra 45:22,23	am 48:7 49:16 70:23 87:7 90:6 120:16 140:24 149:5 197:12 211:5 219:19,22 226:8,10	and/or 17:24
advisory 12:9	algorithm 81:7 85:3 107:7 129:4 130:10 132:17 134:10 135:9,11 139:15,16 180:8	amazing 151:19 224:5	ANN 2:2 85:18 90:1 168:18 173:21 174:15 191:4 193:1 194:1 202:9 204:5 208:23 209:16 212:23 219:13,15 223:5
advocacy 215:12	algorithms 17:5 65:10 80:19 84:8,18 85:1 86:6 103:23 107:3 111:16,20 130:5,6,9,12,22 138:21 179:23 181:8	ambitious 75:8	announcement 127:7
AES 148:7	align 180:20	America 29:6,7 121:20 122:17 211:6 215:13	annual 218:12
affect 82:5 177:24	aligned 120:24 121:8	American 104:2	anomalies 132:12
affecting 162:17	aligns 65:11	among 116:12 118:17	answer 27:6,19 29:23,24 30:11 35:9,10 45:21,23 51:14 57:24 79:14,17 80:1 86:9 95:12 96:16,19 101:8,12 111:8,12,13 113:2 123:23 124:13 154:1 162:8 180:11 182:21 183:7,23,24 184:5 187:8,20,23 188:2 191:4 197:8 199:21 200:2 201:2 219:2
affiliation 215:8	alliance 20:10 222:4	amortized 98:11	answerable 113:14
afford 184:1	allocated 184:1	amount 6:8 39:6 65:9 96:4 103:16 141:12 148:23 176:10 197:23 203:13 206:15 222:8	answered 102:2
afraid 6:3	allow 3:3 37:21 38:6 54:6 58:7 132:19 153:7,10 181:14 190:15	analogy 165:24 198:24	answering 199:17
afternoon 5:4 6:11 7:15 35:6 47:9 48:23 49:3 58:23 60:10 93:21 101:9 107:17 123:10 124:21 126:17 127:12,13 184:2 215:9 225:13	allows 2:16 33:10 54:24 65:7 110:21 140:21	analyses 31:3 63:22 68:10 73:15 139:10	answers 70:17
afterwards 84:18		analysis 27:24 31:4 63:4,15	
against 33:23 135:1 166:9 198:13 200:7 201:20			
age 110:15			
agenda 5:12 41:6 176:11 178:21 182:18			
agent 25:8			
aggregate 132:4 149:4			
aggressive 18:19,21,23			
ago 72:7,9 128:15 129:16,21 169:1,11 183:14			
agreement			

84:12 96:24 104:14 117:23 154:3 197:10 209:22 217:8 219:11 ante 203:1,14 antidepressants 110:2,3,4 Anybody 126:14 anymore 83:8 129:22 165:15 189:7 anyone 36:8 38:22 41:21 50:13,16 52:3 59:24 71:11 72:11 75:13 82:10 111:21 124:22 126:6,16 135:6 142:20 150:23 161:24 185:18 192:21 210:19 anyone's 75:1 anything 55:1 68:17 82:10 84:19 89:23 111:22 122:4 143:4 146:18 173:19 176:6 184:8 216:1 217:17 anytime 138:20 anyway 129:15 145:15 200:23 anywhere 72:6 99:14 103:14 138:20 apologies 117:15 apologize 6:9 127:23 appealing 205:11 appears 141:4 Applause 224:12 application 33:10 191:11 applications 19:1 117:21 136:8 applied 27:18	32:21 33:22 203:8 applies 26:15 apply 32:21 83:2 120:5 130:7 204:1 221:9 applying 185:24 appreciate 50:11 119:4 223:8,11 approach 13:6 40:16 71:7 72:1 86:14,15 92:17 97:15 107:23 128:17 132:3 133:10 134:3 135:17 136:21 139:5 148:3,9,10 154:9 175:16 189:19 192:16 approaches 71:9 107:16 128:12,16,23 129:3,5,18,22 131:12,15 132:17,19 133:12,22 134:19 appropriate 91:5 106:6 134:3 155:21 156:14 212:21 appropriately 43:15 64:14 155:2,15 174:20 approximate 35:8 approximated 207:19 approximately 82:24 98:5 117:13 approximation 131:15 April 2:4 8:16 apropos 102:22 arbitrarily 129:11 arc 85:19 Architect 118:5 architects 118:7	architectural 118:4 architecture 162:20,23 area 6:5 39:13 40:8 43:17 44:14 45:17 46:3 49:16,19 75:24 76:16 162:15 205:16 223:8,13,20 areas 26:22 94:22 99:15 106:4 132:22 149:24 153:20,21 188:13 196:1 arena 39:10 aren't 34:5 93:17 108:15 169:2 189:3 argue 55:22 83:22 argument 35:11,12 46:7 48:16 99:3 100:19,22 140:3 179:21 187:1 argumentation 116:22 argumentative 173:12 arguments 35:3 44:23 98:20 103:24 Arizona 10:23 62:24 armies 78:3 army 168:8 198:24 arrival 220:11 arrived 166:3 article 49:8 95:5 articulate 100:24 articulated 32:7 artificial 36:11 64:15 79:21 81:16 102:11,16,18 106:7 125:10	artificially 135:11 arts 4:1 18:4 109:6 aside 199:7 aspect 16:8 18:4 146:11 aspects 119:5 145:11 213:12 assemble 38:5 assess 34:24 35:13 71:7 111:16 139:8,11 175:2 180:19 181:3,11 196:9 assessed 83:23 208:20 assesses 70:23 assessing 139:12 180:21,22 181:17 assessment 1:7,8 2:8,24 3:2,22 4:9,10,16,21 5:14,15 8:9 11:18,23 12:19,20,21 13:20 14:10,13,16,22 15:11,18,24 17:1,15,22,23 18:2,7,8,20,22 20:24 22:6,10 23:20 24:19 25:3 27:4,21 32:20 35:5 50:5 52:14 71:1 79:23 81:24 82:11,21 83:9,17,19 85:11 88:3,4,18 91:9 98:18 102:10 108:17 109:6 114:18 117:19,20 118:2,16,20,24 120:7,23 121:3,7,14 122:7,11,16,21 123:2,21 125:12 139:4 144:19 150:4 151:21,22 152:17,21,23,24 153:1,5 158:14
--	--	--	--

<p>167:6 174:21 175:10 177:13 187:24 188:1,14,21 189:12,13 190:12,13,16,17, 18 191:13 193:5,11 197:3 198:15,17,19,21, 23 205:15 206:24 217:24 218:11 220:2,7,8,16,18, 22 221:12,13,21 225:10</p> <p>assessments 3:9,21 4:2,18,20 6:17,24 12:12 13:10 14:19,21 15:10,22 19:5 20:15 21:5,10 22:7 23:13 81:17 84:10 88:10 89:2,3 97:20,21 98:2 118:9 123:18 137:6 185:13 220:10 221:6 223:17</p> <p>assessor 29:3 137:5,12</p> <p>assessors 136:22</p> <p>assign 160:10,16 161:10</p> <p>assigned 36:13,16</p> <p>assigning 159:8</p> <p>assignment 94:1</p> <p>assignments 146:16</p> <p>assigns 33:5</p> <p>assist 113:20</p> <p>assistance 1:9 2:22</p> <p>associate 38:8</p> <p>associated 18:17 33:4 57:18 79:7 105:7,9 108:3 148:17 152:22 202:17</p> <p>association 119:7,11 211:6</p>	<p>associations 73:3</p> <p>assuming 93:13</p> <p>assumption 70:8 82:24</p> <p>assurance 157:4</p> <p>assurances 175:5</p> <p>assured 41:20</p> <p>attach 199:20 203:11</p> <p>attempt 13:16</p> <p>attempts 218:12</p> <p>attend 152:3</p> <p>attention 145:5 185:22 206:7 211:17</p> <p>attorney 226:11</p> <p>attract 201:19 202:5 206:7</p> <p>attributes 145:7</p> <p>atypical 117:11</p> <p>audacious 199:11 200:6</p> <p>audience 11:16 19:24 25:15 74:9 126:9,14 210:2 224:15</p> <p>August 2:6 224:24</p> <p>authentic 21:7 98:13 185:13</p> <p>author 129:17</p> <p>automated 5:3,5,16 6:12,22 7:10 11:19 17:8,11 18:18 23:5,6 24:10,16 25:14,16,19,20,2 2 27:2,6,11 29:16 30:18 31:12 34:21 41:13 43:4,13,15 44:7,8 45:18 46:11,12,20 47:7 49:5 51:7,19 52:14,21 53:1,8 55:14 74:21 75:9,11 78:22 79:6 81:20 82:17</p>	<p>84:12 85:20 86:10,21 89:24 90:2 95:24 98:17 100:2,6 106:1,7 108:21 109:13 113:6 117:16,19 118:1,8,19,23 119:2,8,9,14,15, 21 120:5 127:18 128:10,13 144:21 145:9,17 150:3 152:16 153:12,16 154:9,16,20,22,2 4 155:5,7,10,17,22 156:14,16 158:7,9,23 159:2,5,13,20 160:8,9,14,19 161:1,4,8,20 164:3 165:4,24 170:9,12,17,18,2 1 171:1,7,12,19 172:7,10,14 173:3 174:10,12 175:4 177:20 179:18 185:21 187:13 190:5,8 192:7,8,10 198:15 204:17 206:24 207:12 210:8 212:17</p> <p>automatic 79:20 89:22</p> <p>automatically 27:3,9,12 45:9 89:18 141:5</p> <p>Availability 148:13</p> <p>available 8:17 21:9 26:20 55:2 124:5 126:22 149:1 158:5 167:24 168:5,7 183:14 224:16 225:5</p> <p>average 129:13 146:23 147:6,7</p> <p>Averaged 129:12</p> <p>award 198:3 202:19 203:5,24</p>	<p>awards 165:7</p> <p>aware 91:22 101:21 143:12 149:5</p> <p>away 57:22 59:3 115:1 161:2 181:1 192:18</p> <p>awful 50:7</p> <p>axes 198:11</p> <hr/> <p style="text-align: center;">B</p> <hr/> <p>baby 181:2</p> <p>background 41:12 74:20 126:6 211:10</p> <p>backup 161:3 192:11</p> <p>bad 28:19,23 56:6 60:13,14 80:13 90:17 129:8,10 181:22 216:19</p> <p>Balanced 4:10 10:3,16,18 11:6,14,16,23 12:1 17:12 18:21 41:5 75:5,7 123:1 127:15 155:17 165:11 191:17</p> <p>bank 15:3 17:19 82:15 83:4 124:1,2</p> <p>barriers 57:23 218:8</p> <p>base 31:21 81:22 205:13</p> <p>based 14:21 15:2 21:16 31:19 34:6 43:14 45:11 53:13,19 60:24 73:4 110:19 111:3 123:2 162:13 163:7 170:1 174:1 175:8 180:19 214:9 216:5</p> <p>basic 40:1 43:7 77:17 88:8 93:2 126:6 166:2</p>
--	--	--	--

167:23 187:15	36:21 42:24	billion 205:1	brainstorm 196:5
basically 31:11,22	47:13,20 49:9	biology 89:16	brainstorming
55:13 56:20	58:21 76:15 87:7	132:24	195:16
60:11 63:22 76:8	90:7,12 95:22	bit 5:13 15:6 23:1	brands 163:8
143:4 157:12	105:7 120:4	26:19 29:20	brass 52:1
169:20 183:16	174:15 191:17	35:6,24 45:3	breadth 224:3
basis 42:18 48:2	201:24 217:3	49:24 52:9,22	break 5:21 6:2
122:9 145:21	believed 43:24	60:7 82:20 87:1	7:13,15 50:15
175:8 221:10,22	106:5	94:24 96:2,22	71:13,14 73:15
bat 99:12	benchmark 15:4	104:15 105:18	74:3 148:18
batch 158:12,14	152:24 180:10	106:17 107:17	173:24 194:5
159:7	200:12	108:9 125:4,20	199:24
batching 158:15	benchmarks 19:6	131:14 136:6	breaking 170:22
bath 181:2	111:4	139:14 147:22	breaks 96:17
bathrooms 74:5,6	best 28:12 43:9	158:21 160:4	breakthrough
beaches 29:10	47:6 76:13,20	163:12 165:3	125:21 126:1
bear 59:20	129:18,19,20	177:23 187:2	198:1,7,12
bearing 210:3	160:15 170:18	bites 45:4	breakthroughs
beat 42:8	175:1,10,14,18	black 132:6,7,19	196:2
became 130:21	201:5 209:7	172:12	breeds 57:21
become 87:5 91:18	212:19	blend 47:5 153:11	Brian 10:6 41:2
107:14 113:15	220:13,24	blended 160:4	52:7,18,19 59:22
115:23 120:1	bet 208:3,4	Blessing 11:2 24:8	60:2,9 61:7
147:22	better 35:20	93:11 192:12	62:10,19 84:5
becomes 94:2	66:15,19 71:6	193:23	87:23 93:11,20
113:17 117:1	76:14 87:1 89:7	block 61:14	94:19 100:16,17
134:20 151:12	93:12 97:17	76:21,22	101:7 106:16
178:7 181:23	98:13 101:2,12	blue 46:19	108:11 128:5,6,7
182:12 201:13	104:10	board 10:5,7	135:4,6,14 136:2
begin 164:7	107:15,24	52:8,13 110:4,5	167:20
178:17 212:20	108:13 110:9,10	body 139:13	168:18,21
beginning 3:14	117:6 129:23	bold 194:10,20	172:12 176:3
42:13 45:16 49:6	130:6 131:3,10	195:9 199:12	179:8,15 182:16
86:3 95:1 99:2	146:20 149:14	bombastic 115:23	185:5,20 187:7
begins 54:1	166:15 167:13	boring 150:11	Brian's 106:11
begs 203:18	170:14 172:2	born 189:3	178:20
begun 218:9	176:22,24	bottom 67:14	brick 28:14
behavior 28:16	177:9,10 178:22	177:13	bridge 189:17
197:16 198:1	179:11 181:13	bought 103:17,18	Bridgeman 49:8
behavioral 46:23	183:5,9,19 190:1	177:5	brief 7:1,24 54:1
behind 20:22 42:4	217:2,15	boundaries 179:5	114:16 127:23
112:6 116:4	beyond 44:2 114:7	bounty 197:22	briefly 12:6 98:24
156:20 193:22	121:20 140:19	box 6:6 126:22	131:11
behold 103:7	190:21 203:23	132:6,7,19	brilliance 28:5
belief 13:11	bias 48:8	172:12 194:16	brilliant 36:24
believe 14:12	biased 218:14	boxes 15:20	bring 34:20 82:22
	bid 165:9		95:4 127:13
	bigger 57:17 196:6		
	biggest 43:5		
	big-time 96:7		

<p>bringing 17:19 23:2 171:8</p> <p>brings 170:4</p> <p>broadband 222:18,22</p> <p>broad-based 39:16</p> <p>broader 25:14</p> <p>broadly 196:4</p> <p>Brook 1:14,17 224:10</p> <p>brought 54:3 107:12 120:13 211:24</p> <p>Bruce 11:9 60:6 61:2 71:15 72:10 104:11 186:11</p> <p>bucks 95:10</p> <p>budget 108:5</p> <p>build 21:1 72:16 95:16 97:11 138:20 141:24 143:13,19 192:6,7</p> <p>building 40:17 63:11 95:18 97:4 111:15 142:8 162:22 168:19 191:9</p> <p>built 44:5 64:17 72:13 136:10 143:9 149:18 168:22</p> <p>bullet 99:24 100:4,12</p> <p>bumps 91:14</p> <p>bunch 47:11 94:4 129:16</p> <p>business 95:21 178:5,14</p> <p>busy 178:14</p> <p>buy 178:12</p> <p>buying 91:17 103:18 177:9</p> <hr/> <p style="text-align: center;">C</p> <hr/> <p>calculate 68:12</p>	<p>69:1</p> <p>calculations 79:16</p> <p>calculator 90:21 105:23</p> <p>calibrate 83:12,15 88:24</p> <p>calibration 147:18</p> <p>California 81:11,12</p> <p>candidates 66:2</p> <p>capabilities 149:21</p> <p>capable 63:4,5</p> <p>capacity 148:14 207:12,14 208:21 213:9</p> <p>capitalize 120:4</p> <p>capture 130:20</p> <p>captures 135:24 156:3</p> <p>capturing 43:6 130:16,19</p> <p>card 102:24 103:1,7 104:5,6</p> <p>care 53:18</p> <p>career 3:19 12:24 14:7 15:5,13 20:22 21:1,12 22:2 185:12</p> <p>career-ready 4:4</p> <p>Careers 4:9</p> <p>careful 173:16 176:16 184:24</p> <p>Carnegie-Mellon 80:18</p> <p>Carthage 30:12,15</p> <p>Cartridge 222:3</p> <p>carve 59:12</p> <p>case 53:1,16 54:8,23 55:1,17 60:13,14,15 75:9 83:2 88:13 138:10 155:4 177:20 192:4 195:23 208:7</p> <p>cases 39:8 89:24</p>	<p>130:7 213:18 214:22</p> <p>case-specific 130:5</p> <p>cash 203:5,24</p> <p>CAST 124:8</p> <p>CAT 18:13</p> <p>categorical 43:17</p> <p>categories 60:17</p> <p>category 129:14</p> <p>caught 196:23</p> <p>causative 133:15</p> <p>caution 130:17 165:20 166:9 184:21 186:12 194:19</p> <p>CBT 91:3</p> <p>CELEX 65:4</p> <p>cell 8:6</p> <p>cement 166:5</p> <p>center 9:20 124:8 146:7 197:14</p> <p>central 14:9 23:10</p> <p>cents 106:22</p> <p>certain 34:21,22 43:22 92:24 100:19 108:15 110:8 134:21,24 153:21,22 188:19 218:10</p> <p>certainly 20:9,19 21:5 25:6 62:10,21 75:8 82:8 110:23 152:3 210:10 212:10,15</p> <p>CERTIFICATE 226:1</p> <p>certified 91:24</p> <p>certify 226:4</p> <p>certifying 196:6</p> <p>cetera 12:5 15:20 93:19 181:6</p> <p>chair 11:9</p> <p>challenge 75:8 196:16 206:1</p>	<p>challenges 118:23 125:22 170:6 195:24 196:1 217:16</p> <p>challenging 13:14 120:1</p> <p>chance 6:5 60:3 82:7</p> <p>change 54:9 108:7,20 127:8 130:1,21 153:7 166:17,23 168:15 176:6,12,14,15 186:17,22</p> <p>changed 58:22 76:19 97:13</p> <p>changes 40:2 53:19 62:11 167:1 197:15,16</p> <p>Chang-Liang 73:17</p> <p>chapter 65:23</p> <p>character 149:13</p> <p>characteristic 40:20</p> <p>characteristics 31:15 32:3 33:23 40:21 129:1 134:21,22 137:9 140:22</p> <p>characterized 66:10</p> <p>charge 31:14</p> <p>charged 63:13</p> <p>charges 95:10</p> <p>Charlotte-Mecklenburg 216:16</p> <p>chart 49:1</p> <p>cheap 97:16 107:1</p> <p>cheaply 101:3</p> <p>check 103:5,6 137:23,24 184:24</p> <p>checker 43:23</p> <p>chemistry</p>
---	--	---	--

<p>122:12,13 chest 54:4,18 Chicago 215:12,21 218:7,15 219:7,21 222:20 224:10 chicken-and-egg 207:13 208:15 child 116:4 151:14 162:8 193:22 216:1 children 75:21 215:23 216:19 217:18 219:10 choice 16:5,7 17:3,7 22:12 23:24 27:6 32:12 51:16 56:18 83:4,9,14,17 86:18 90:3 179:12 193:12,24 choices 141:13 153:13 choose 17:24 18:2 141:17,19 189:4 208:10 choosing 70:16 chop 45:2 87:16,17 chose 141:7 chosen 117:13 139:3 chunk 108:6 circle 122:17 circle's 69:21 city 103:14 122:2,3,4,6 Civil 216:8 claiming 218:5 claims 185:11 clarifications 8:8 9:3 50:17 60:1 clarifying 36:6 50:13 59:24 71:12,16 72:12 135:5 142:20</p>	<p>150:23 162:1 171:20 clarity 130:23 class 16:14 33:6 146:7,14,17 219:1 classes 71:21 153:22 classroom 12:20 34:18 37:15 63:6 142:10,13 144:2 220:4 223:18 classrooms 19:3 21:8 138:24 Claudia 30:2 Clouser 10:6 52:7,19 60:9 61:7 62:10 84:5 87:23 93:20 100:17 102:2 106:16 128:7 135:14 167:20 168:21 176:3 179:15 182:16 185:20 187:7 clear 31:14 125:22 129:17 130:15,22 155:11 158:3 171:23 clearer 147:23 clearinghouse 15:17 clearly 32:7 84:19 97:3 199:22 205:2 206:6 clever 183:14 187:13 click 141:3 client 204:17 clients 88:17 169:5 205:10 206:23 clobbered 30:15 clock 213:3 close 74:6 214:1 closed 216:23 closer 180:4</p>	<p>coast-to-coast 102:7 co-authored 219:23 co-chair 121:2 co-chairs 11:24 coding 109:4 coefficient 48:12 189:23 coefficients 30:23 cofounder 215:13 cognitive 40:7 64:12 186:3 cognizant 71:2 cohesion 64:19 65:14 67:10 141:19 143:12,15 Coh-Metrix 64:16 65:18 67:19 72:14 73:1,10,20 137:4 140:18 142:8 143:9 cold 41:19 Cole 10:1 162:4 collaboration 166:14 178:16 collaborative 2:23 9:20 194:14 colleague 19:20 73:17 127:10 colleagues 20:7 22:3 30:3 31:7 collect 47:23 54:6 111:3 205:6 collected 58:4 73:4 college 3:19 4:4,9 12:24 14:6 15:5,12 20:23 21:1,12 22:2 185:11 Columbia 4:12 Columbus 29:8 combination 71:9 100:9 174:11 189:15</p>	<p>combine 100:5 157:24 158:7 combined 156:13 combines 49:2 Comcast 222:17 comes 12:16 18:17 23:5 42:12 56:11 88:1,23 152:20 157:15 171:20 180:8 220:11 comfortable 49:13 93:7,10 133:20 209:17 coming 31:7 44:20 55:5 76:11 173:12 214:3 comment 6:18 7:4,6,23 38:23 74:9 106:16 112:15 124:22 126:18 144:11 151:7 167:21 219:18 commentators 215:7 comments 6:14 7:17 8:1 74:8,10,13 112:22 113:24 114:7,9 115:13 120:15 151:2 202:10 210:5,6,18,20 214:8 223:21 Commercially 104:1 commission 121:14,15 commitment 12:12 120:3 committed 11:17 12:10 13:3 163:11 committee 97:23 120:17 121:3 Commodore 166:8 168:24 common 12:23 14:4 15:9,10</p>
--	---	---	--

<p>18:5 97:19 98:5 117:20 120:7 121:8 137:7,17 158:17 174:23,24 188:9 189:10,21 198:2 202:17 213:13 214:4 222:3</p> <p>commonly 176:8</p> <p>communicate 88:16</p> <p>communicating 32:15</p> <p>communication 155:11</p> <p>communities 21:22</p> <p>community 32:4</p> <p>companies 104:6 186:13 201:17 205:22</p> <p>company 95:9 102:24 204:8</p> <p>comparability 178:1,5</p> <p>compare 44:23 51:12</p> <p>comparison 109:12,14</p> <p>compensate 141:19,21</p> <p>competing 170:4,8</p> <p>competition 166:13 178:17 202:12</p> <p>competitions 121:18</p> <p>competitive 165:9 205:19,22</p> <p>competitors 207:2</p> <p>complaining 54:4</p> <p>complaint 216:7,8 218:16</p> <p>complete 16:16 199:5</p> <p>completed 19:2 91:11</p>	<p>completely 12:13 44:9 107:22 128:20</p> <p>completes 53:21</p> <p>complex 4:5 44:3 57:6 66:12 79:15 87:5 94:20 125:12 160:14 172:11 186:7,23</p> <p>complexity 57:3 142:23 154:3 158:8 173:22</p> <p>component 18:4 31:19 33:4 38:6 88:7 92:19 100:3 108:21 134:13 140:18 173:20 178:9 183:19,20 189:3</p> <p>components 3:4,22 14:2,8 15:16 19:2 79:7 88:9 98:4 109:8 140:19 141:10,11 163:3 189:16 222:12</p> <p>composed 22:10,16 197:3</p> <p>composing 93:8</p> <p>composite 12:8</p> <p>comprehend 136:19</p> <p>comprehension 136:14 180:23,24 181:1,4,19,20</p> <p>comprehensive 109:14 110:1 211:7</p> <p>comprised 16:4</p> <p>compromising 120:2</p> <p>computational 168:3 169:22</p> <p>computer 14:23 16:4,7,24 17:6 18:4,10 28:1,4,6,13,18,1 9 30:7 33:7,8</p>	<p>35:20 37:2,22 38:2 42:14,17 47:24 61:13 73:14 79:9 80:6 81:21,22 100:20 101:1 121:17 125:23 146:5 162:6,7,9 172:3 199:22 207:19 215:15 222:22</p> <p>computer-aided 118:3</p> <p>computer-based 53:1,16 82:3 125:11</p> <p>computerized 57:5 82:14 83:5</p> <p>computers 166:1 187:11 207:21 222:18</p> <p>computer's 162:12</p> <p>concept 155:2 195:10,16 198:10</p> <p>conceptual 65:15 70:9 116:16 148:9 189:19</p> <p>conceptualizing 70:2</p> <p>concern 112:2 116:16 117:3 135:18 212:15 213:14,17,23 217:17</p> <p>concerned 51:21,24 121:12 147:2 149:23 186:12</p> <p>concerns 81:20 217:20</p> <p>concludes 113:22</p> <p>conclusion 7:16 35:14 139:13 144:17 167:8 179:22</p> <p>conclusively 110:13</p> <p>concrete 179:13</p>	<p>conditional 161:6</p> <p>conditions 199:15 201:13,21 206:2 207:23</p> <p>conducted 30:2</p> <p>conducting 209:15</p> <p>confidence 116:12 214:2</p> <p>Configurability 156:11</p> <p>configure 158:4</p> <p>configured 146:4 156:12</p> <p>confirm 54:19</p> <p>conflating 72:24</p> <p>confusion 143:10</p> <p>Congressman 120:21</p> <p>conjunction 155:7 213:24</p> <p>connect 14:15</p> <p>connected 15:9</p> <p>Connecticut 10:1 11:5</p> <p>connecting 12:23 73:5</p> <p>consequences 134:18 177:6,12</p> <p>consequential 118:2,24 184:23</p> <p>consider 50:4,6 65:14 123:1 141:10,20 152:18 153:15,17 154:12,14 155:21 170:22 196:10 200:1 206:7 210:7</p> <p>considerable 176:10</p> <p>consideration 59:6 79:1</p> <p>considerations 31:9 136:8 141:6 152:15 154:8</p>
--	--	---	---

<p>considered 141:15 151:6</p> <p>considering 6:23 201:14</p> <p>consistent 46:13 50:24 79:23 160:23 189:20,24</p> <p>consistently 157:3</p> <p>consortia 2:23 3:5 4:11,24 5:4,14 6:14 8:13 10:10 26:3 97:18 98:8 108:24 120:4 152:15 155:17 163:16 168:4 173:22 190:3,4 191:11 195:19 196:13 199:9 208:3 210:7 223:9,23</p> <p>consortium 4:10 7:8 11:23 12:2,3 13:11,17,18 18:22 20:9 121:6 178:4,10 190:11 222:2</p> <p>constantly 107:15</p> <p>constitute 117:18</p> <p>constrained 54:13 76:3 80:20 111:8,9</p> <p>constrains 80:23</p> <p>constraints 44:15 106:5 200:21</p> <p>construct 44:22 57:23 68:8 73:9 80:15 106:3 118:4 125:21 130:16</p> <p>constructed 68:20</p> <p>construction 44:21 46:8 76:6</p> <p>constructive 16:5,8 17:3,8 22:13,17,20,24 27:6 29:21 44:13 45:8,21 81:24 86:17 90:5</p>	<p>117:18 155:19 157:13 161:14 171:22 185:16 187:16 188:3,15 221:3</p> <p>constructs 119:12</p> <p>consultant 196:20 211:11</p> <p>consultations 54:8</p> <p>Consulting 219:22</p> <p>contact 19:11 25:5 126:8 197:7,9 209:10,20</p> <p>content 4:4 29:1,2,4 31:15 35:21 38:3,5,9,11 46:2,4 53:13,15 54:12 57:22 60:11,20 90:13 98:18 99:23,24 106:4 109:3,20 111:10,11 133:23 140:17 153:20,21 164:10 172:8 173:8,10,12,19 174:1,19 175:2 188:13 214:22,23 215:1</p> <p>contest 121:23</p> <p>contestants 42:9</p> <p>context 27:3 42:16 46:11 57:10 64:16 139:2 183:17 196:11</p> <p>contextualize 63:10</p> <p>continent 29:11</p> <p>continue 23:8 159:22 166:11 192:2 194:7 223:16 225:8</p> <p>continues 192:1</p> <p>continuously 13:19</p> <p>contracts 165:8</p> <p>contrast 44:23</p>	<p>85:16</p> <p>contribute 16:11 17:5 18:15 137:9 184:8</p> <p>contributing 15:1 17:14</p> <p>control 56:23 61:21 184:15,20</p> <p>controls 184:11</p> <p>conundrum 83:16</p> <p>conventions 32:13,17</p> <p>conversation 7:16,19 28:11 102:20 126:4 127:14 185:6 195:14 196:15 198:6 199:6 205:24 209:18 223:7</p> <p>conversations 223:21</p> <p>conveyed 78:9</p> <p>copies 26:8 224:14,16</p> <p>copy 5:12 126:15 141:2</p> <p>copying 150:2</p> <p>core 12:23 14:4 15:9,10 18:5 71:19 97:19 98:5 117:20 120:7 121:8 137:7 174:23 188:9 189:10,21 204:3</p> <p>corpora 96:8,10</p> <p>corpus 65:17 70:17 73:8,11,13 110:19,20 111:3,15 139:10 214:20</p> <p>corpus-based 111:7 214:16</p> <p>corpus-independent 138:21</p> <p>correct 19:15 30:10</p>	<p>45:18,20,23 90:8 102:13,14 111:12 153:24 154:2 157:7,8 164:18 207:10</p> <p>corrected 47:21</p> <p>correction 48:4</p> <p>correctly 100:13</p> <p>correctness 29:23 35:8,9 98:19</p> <p>correlation 83:16,18 124:10,11 129:20 130:14 138:11 148:4 188:23 189:22</p> <p>correlations 30:22 31:4 55:8 129:23 130:7 139:16</p> <p>corresponding 182:7</p> <p>cosign 69:4,5,16 70:3</p> <p>cosigns 69:1,13,14 73:24</p> <p>cosines 137:23</p> <p>cost 18:17 56:13 94:22,23 95:3,8,12 96:11,12,13,15,1 8,20,22 97:4,21 98:9 102:6 104:15 105:13 150:19 154:13,16 200:15,19 204:16 206:13,17,18 219:4</p> <p>cost-effective 77:5</p> <p>costs 95:1,23 96:2 97:3,7 98:10 105:6,7,9,12,14 106:17 206:5,21</p> <p>cottage-type 175:22</p> <p>Council 115:18 120:19</p>
---	---	---	---

Council's 121:3	credibility 209:12	cuts 178:13	114:12 117:9,10
counsel 163:15 226:8,11	credit 102:24 103:1 104:5,6	cutting 151:3,8 161:17 192:19	120:8 210:23 213:1,2
count 148:23	crime 122:5	CXR 54:17,18	day 5:11 6:18 7:5 8:6 9:5 56:19
country 12:8 98:7 122:21 219:8	crisp 125:22	cycle 85:24 196:3	58:20 59:14,15 93:24 110:24
counts 137:22	criteria 29:19 101:1 131:2,18 148:7 164:2 185:24 208:7,10	cynical 97:14	159:17 195:6 205:23 223:10
couple 4:14 7:1 8:5 36:10 61:15,24 64:20 76:18 80:14 85:21 106:4 112:17 126:7 128:1 134:5 213:4 219:3	criterion 28:10,12 135:24	<hr/> D <hr/>	day-and-a-half 56:18 184:3
coupled 165:10	critical 24:16 119:11 153:21 159:13 182:1 201:13 209:24	D.C 2:6 225:1	days 106:2,8 182:2 207:5
course 23:2,20,21,23 24:1 43:16,21 45:15 46:21 84:8 89:16 97:2 113:14 131:1 158:17 193:21 199:1,2 204:9	cross 34:14 130:13	daily 182:2	day-to-day 145:20
courses 24:12,19	crossing 76:11	damage 219:10	dead 220:11
COURT 226:1,21	cross-validate 34:3	Dan 10:13 19:19 20:3,5,6 23:9 24:23 61:3 62:3 151:1,2 185:4	deadline 195:22 196:12,16
cove 158:1	cross-validated 34:1	dance 173:19	deal 37:3 39:2,11 103:12 186:2 192:9 212:1
cover 3:24 4:3 75:17 99:15 213:24 222:7	crowd 196:8	Danielle 10:21 40:13,14 41:1 62:21 63:8,9 71:10,22 72:12,23 74:2 80:17 84:23 85:22 93:22 94:14 96:1 100:16 101:6,7 110:17 135:8 136:4,5 142:18,21 143:6 144:5 167:17 178:20,24 179:16 214:6	dealing 135:12,13 154:11 214:22 223:14
covered 100:1	Crystal 1:16	data 3:14 43:11 48:2 64:5 121:3 122:3 123:17 124:2 139:14 156:24 158:6,23 159:6,19 168:7 191:7 193:19 198:13 205:6 219:24 220:20	dean 10:12 25:17
covers 88:8	cumulative 169:12	databank 218:13	decade 116:3,4 203:3
CPA 87:24 88:9,15,16,20	curiosity 213:7	database 72:13	Deception 66:1
CPAs 88:6,10	curious 92:4 214:7	databases 65:2	decide 163:11 164:7,8 176:13 216:21
crank 105:15	current 5:2,24 6:22 9:3 49:15 91:23 105:19,20 139:15 166:20 174:2 199:15 200:7 201:17,20	date 19:12 192:14	decision 13:18 61:18 62:5,6 80:11 163:17,19 216:5
crazy 51:7	currently 25:17 26:20 28:13 53:6 76:17 91:22 97:4 179:3 209:5 219:21	daunting 186:21	decision-making 17:16
create 21:4 37:21 39:22 60:12 73:16 86:7 90:24 92:1 113:8 122:19 168:14	curriculum 94:2 114:20 149:19 182:11 184:11 217:22 218:2	David 42:10	decisions 13:17
creates 28:15	cursive 76:22		decompose 68:21,23
creating 75:8 102:11	curve 147:3		decomposition 67:24
creative 36:24 149:17 196:7	culp 86:11		decreased 18:11,12
	cut 161:21 198:8		decreases 111:7
	cutbacks 218:24		deduct 28:20
			deeper 5:23 6:11 181:14,18,19

deep-freeze 199:21	11:3,5,9 20:6 25:7 219:24 224:17	3:16,17,18	develops 56:14,16
default 117:1 183:3	depend 69:7,9	determine 29:23 35:9,10 148:21 161:21 206:4	device 92:7 93:15,18 105:23 123:20 186:20
define 35:18 45:15 64:12 201:12 205:12	dependent 30:1 70:21 129:2	determined 139:10	devices 91:18,22 92:5,7
defined 16:14 169:4	depending 28:20 29:19 38:18 87:18 88:24 99:14 109:9	develop 4:20 35:21 38:10 42:5 56:22 77:20 81:5,7 96:8 97:6 99:6 103:22 109:6,9 120:23 128:18 133:9 146:1 167:8 193:5 197:13 204:8,16 206:5 208:9	diagnostic 147:24 211:11
defining 173:16	depends 68:9,10 69:10 70:18,22 78:19	developed 32:10 41:13 65:2 68:14 80:18 86:4 89:23 96:13 131:20 140:19 145:9 167:10,22 169:1 213:11,22	diagrams 149:13
definitely 60:2 127:16 162:14 165:17 194:24 218:15	described 56:9	developers 206:10	dialectic 46:8
definition 32:5 37:1	describes 128:20	developing 6:24 24:24 32:2 33:17 44:3 80:21 84:7,18,24 86:6 96:12 97:9,10 98:1 106:19,21 107:2,7 121:7 130:10 137:6 140:20 141:1,6 169:22 178:15 181:9 185:21 197:17 204:4	dialogue 67:1 117:4,12
degree 29:23 34:24 35:2 96:10 98:19 101:15,18,20,21 140:4 173:10,17	describing 52:20	differences 49:21 65:19,21,22,24 66:2,5 67:6,16 119:15,17	diameter 69:21
delay 62:5	description 164:10	different 21:20 31:12 40:16 45:10 49:22 59:4 64:7,9,11,19 65:3,17,20 66:11,21,23 67:4 71:1 73:6 74:21 81:14,17 84:2 85:6,19,21 86:6 98:3,4 102:8 103:17 109:4,9,13,19 110:6,15 113:16 118:18 122:17 123:22 128:12 135:12 136:21 149:11 153:1,2 156:24 157:11,13,16,19, 24 158:6 159:5,6 162:23 163:8,10 166:13,24 167:2,23 169:9,10 172:14 174:19,20 178:6,14	dictated 77:16
deliberations 122:24	design 5:15 6:16 8:10 11:18 12:14 13:3 20:23 22:14 24:9,24 85:19,24 116:16 118:3 119:3 125:16 142:16 154:23 162:20 163:12 171:2 214:11	differences 49:21 65:19,21,22,24 66:2,5 67:6,16 119:15,17	dictation 169:8
deliver 3:7 55:20 57:5,10 186:19 190:12,13,20	designed 3:7 36:20 89:22 150:20 214:12	different 21:20 31:12 40:16 45:10 49:22 59:4 64:7,9,11,19 65:3,17,20 66:11,21,23 67:4 71:1 73:6 74:21 81:14,17 84:2 85:6,19,21 86:6 98:3,4 102:8 103:17 109:4,9,13,19 110:6,15 113:16 118:18 122:17 123:22 128:12 135:12 136:21 149:11 153:1,2 156:24 157:11,13,16,19, 24 158:6 159:5,6 162:23 163:8,10 166:13,24 167:2,23 169:9,10 172:14 174:19,20 178:6,14	difference 24:21 59:8 71:19,24 81:20 82:5 111:5 154:19 173:4 207:3
delivered 61:13	designer 143:2	development 2:24 11:24 13:6 14:15 15:19 19:7 20:15 23:15 35:16 37:24 38:4 39:13 40:6 56:14,15,20 85:19 98:14,22 100:10 108:6 116:14 117:5 149:13 159:10 166:11 190:16,17 197:16	difficult 67:1 117:4,12
delivery 5:7 23:16 50:7 91:23 156:2,3 158:20 159:1 162:24 190:12,13,18	designs 8:13 87:6 113:15 118:4	developmental 26:22	diameter 69:21
demand 171:21 207:14,22	desirable 204:17		dictated 77:16
demographic 119:16	desire 193:13		dictation 169:8
demonstrable 203:7	desks 16:18		difference 24:21 59:8 71:19,24 81:20 82:5 111:5 154:19 173:4 207:3
demonstrate 175:14	Despite 112:21		differences 49:21 65:19,21,22,24 66:2,5 67:6,16 119:15,17
demonstrated 31:3 198:13	destroyed 30:11		different 21:20 31:12 40:16 45:10 49:22 59:4 64:7,9,11,19 65:3,17,20 66:11,21,23 67:4 71:1 73:6 74:21 81:14,17 84:2 85:6,19,21 86:6 98:3,4 102:8 103:17 109:4,9,13,19 110:6,15 113:16 118:18 122:17 123:22 128:12 135:12 136:21 149:11 153:1,2 156:24 157:11,13,16,19, 24 158:6 159:5,6 162:23 163:8,10 166:13,24 167:2,23 169:9,10 172:14 174:19,20 178:6,14
demonstrations 4:5	detail 60:10 86:3 136:6 190:4		difficult 67:1 117:4,12
Department 1:5 3:1 4:24 7:9 8:23 9:23 10:2,9,14	detailed 133:13		diameter 69:21
	details 225:7		dictated 77:16
	detect 150:1		dictation 169:8
	detecting 158:16		difference 24:21 59:8 71:19,24 81:20 82:5 111:5 154:19 173:4 207:3
	determination 50:22		differences 49:21 65:19,21,22,24 66:2,5 67:6,16 119:15,17
	determinations		different 21:20 31:12 40:16 45:10 49:22 59:4 64:7,9,11,19 65:3,17,20 66:11,21,23 67:4 71:1 73:6 74:21 81:14,17 84:2 85:6,19,21 86:6 98:3,4 102:8 103:17 109:4,9,13,19 110:6,15 113:16 118:18 122:17 123:22 128:12 135:12 136:21 149:11 153:1,2 156:24 157:11,13,16,19, 24 158:6 159:5,6 162:23 163:8,10 166:13,24 167:2,23 169:9,10 172:14 174:19,20 178:6,14

181:7,8,9,10,11 183:23 194:16 198:9 202:15,16 208:12 213:19	discombobulated 29:14	219:7	Dr 26:13
differential 108:9	discount 78:24	diverge 140:7	drafted 121:11
differentiate 207:1	discourse 27:24 35:2 42:23 65:12 224:3	divergent 119:12	drafting 120:20
differently 170:11 177:23 193:11,13 194:15 224:7	discover 61:23	diversity 66:12,20 67:2	dramatic 186:22
difficult 57:7 76:9 101:5 136:19 142:24 143:3 183:10	discovered 18:20	divide 64:10	draw 122:18
difficulties 57:3	discovery 29:6	divided 22:8	drawing 82:16
difficulty 83:3,12,15 84:1 88:24 137:10 140:22 141:7,9 143:7	discredited 176:1	divides 32:11	drew 47:3
digital 15:17 197:3	discrete 172:1	dividing 173:7	drift 47:17,20,22 48:5,6,7 160:22
dimensions 64:19 73:22	discrimination 216:8	Dixon 114:13 123:9,10	drifting 48:1
dinner 102:23	discuss 3:3 60:10 141:22	doctor 69:4,5	drive 41:5 43:20 184:16 206:14
direct 18:6,7 96:3 97:1 101:14 119:6	discussed 22:22	doctoral 168:8	driven 53:15 54:12 90:13 116:10 205:7,8
direction 13:15 38:1 41:8,9 42:23 48:9 62:7 80:10 87:4 97:3 149:10	discussing 62:12	Doctors 69:18	driver 62:12 188:10
directional 81:13	discussion 5:18,20,23 8:21,22 9:7 15:17 16:20 74:8 79:11 91:16 123:13 126:18 127:8,13 128:4 161:23 167:6 171:1 192:15 202:13 203:14 213:5,6	document 51:17 68:12,17	drivers 57:4 201:17
directions 35:15	disparate 218:15	document- document 68:15	drives 153:13
directives 68:24	displayed 20:18	documents 34:16 69:11,13,17	drop 199:12
director 115:18 215:10	dispositions 175:3	dollars 91:19 98:1,10 106:21 197:23	dropping 97:7
directors 112:5	dissertations 168:9	domain 101:17 175:2	drug 110:6
Dirir 11:4 81:9,23 102:1	distinction 62:4	domains 125:23	Drury 1:15
disabilities 2:7 3:13 24:5 39:4 49:15 155:14 211:6 225:2	distorting 114:19	done 12:4,5,13 21:14 25:20 31:6 45:1 65:17,20 84:1,8 93:16 110:12 128:14 142:6 146:13,18 160:11 171:2 191:10,24 197:24 202:20 203:2,6,23	druthers 200:5
disagreement 133:7	distribution 34:9,12 159:18	door 6:7	due 2:12
discard 105:2	distributions 49:12	doubled 55:18	dumb 46:12 72:4
	district 4:12 147:17 149:5	doubt 188:11 218:22	dumber 28:14
	district-by-district 217:13	doubts 183:14	during 7:13,14,15 8:18 18:15 22:7 55:12 57:6 58:20,22 107:19 112:4,19 116:4,8 124:23 138:2 144:13 201:1
	districts 21:23 91:17 200:22 207:17,20 218:4	Doug 114:11,14,15	dynamic 9:17 53:17,18 119:22
		download 87:2,3	<hr/> E <hr/>
		downside 133:11	E.B 36:22
		dozens 182:19	earlier 14:2 17:21 37:23 39:19 102:20 112:22 120:14 148:14 157:9 158:15 189:14 198:22

<p>208:1 213:6</p> <p>early 20:14 31:5,6 43:2 106:2 224:18</p> <p>easability 137:5 140:18</p> <p>ease 137:10 141:7,8</p> <p>easier 87:19 106:6 117:2</p> <p>easily 80:21 95:12 160:17</p> <p>East 197:18</p> <p>easy 49:10 142:2 160:18 162:8 172:22</p> <p>echo 94:14</p> <p>economically 186:7</p> <p>Ed 210:23 211:4,5</p> <p>edge 46:15 192:19</p> <p>editing 40:1 77:17</p> <p>educate 67:24 223:12</p> <p>education 1:5 3:1 6:20,21 8:24 9:15,24 10:2,5,9,14,16,1 8 11:3,5,10 20:7 24:22 25:8 71:17 120:18 184:17 186:6 211:10 215:11 217:15 219:24 222:1 224:17</p> <p>educational 32:10 120:11 146:19 217:6 218:24</p> <p>educator 211:11</p> <p>educators 12:19 14:15 15:19,23 17:20,24 21:10 116:12 137:8 140:21 182:14 191:16</p> <p>effect 49:12 58:14,15</p> <p>effective 3:8</p>	<p>116:15 120:23 137:21 150:19 200:15,20</p> <p>effectively 88:16</p> <p>effectiveness 3:16,17 102:6 206:13,16,17,19, 24</p> <p>effects 83:21 145:23</p> <p>efficiencies 94:23 95:2</p> <p>efficiency 23:11 89:5 108:23 130:9</p> <p>efficient 55:10 107:5 129:24 131:17 133:9 186:8</p> <p>efficiently 131:20</p> <p>effort 42:11 107:4 120:2 152:5 175:14 176:10,14 194:15 196:14</p> <p>efforts 2:23</p> <p>eight 78:11</p> <p>either 36:5 87:19 104:4 131:3 148:11 198:5 200:1 203:6</p> <p>EKG 54:17</p> <p>elaborating 140:6</p> <p>eLearning 219:20</p> <p>electrocardiogram 54:18</p> <p>electronic 27:20 33:4 92:22</p> <p>electronically 91:10</p> <p>Elementary 9:23</p> <p>elements 35:3</p> <p>elicit 4:4 131:2</p> <p>ELL 27:16 212:13</p> <p>else 38:22 52:3 59:5 72:11 103:14 110:11</p>	<p>156:18 160:11 170:5 176:20,21,22 185:18 196:24</p> <p>e-mail 8:2,3 200:2 210:21 219:16 225:5,10</p> <p>Emanuel 222:21</p> <p>embed 212:17</p> <p>embodied 119:4</p> <p>emergency 54:4</p> <p>emotional 31:18,19</p> <p>emphasis 12:17 165:4</p> <p>emphasize 56:13 121:1</p> <p>empirical 119:7 148:9 176:21 177:8 178:22</p> <p>empirically 83:1 205:7</p> <p>employed 182:20 226:9,12</p> <p>employee 226:11</p> <p>empty 11:8</p> <p>emulate 28:16</p> <p>encourage 82:8 153:17 194:13,17 195:1 220:3,15</p> <p>encouraged 220:1</p> <p>end-of-instruction 23:21</p> <p>endorsing 8:24</p> <p>energize 197:1</p> <p>engage 174:20</p> <p>engine 17:5 37:16 60:8 105:6,15 109:2,7 111:19 142:23 163:6 164:7,22,24 167:1,9,13 177:22</p> <p>engines 28:9 29:2,16 109:9,13 110:9,10 118:19</p>	<p>163:23 165:5 167:12 177:21 178:6 213:19,24</p> <p>English 2:8 3:12 24:5 27:13,15 78:23 79:8 89:16 115:19 118:13,15,21 149:7 155:15 225:2</p> <p>enhance 92:2</p> <p>enhancement 206:21</p> <p>enhances 133:17</p> <p>enormous 222:8</p> <p>ensure 5:7 102:12 119:21 164:3,18,21</p> <p>enter 54:21 90:22 92:9</p> <p>enterprise 32:3 94:13</p> <p>entire 13:8 68:4 98:7 139:5 141:14 151:20 207:22</p> <p>entirely 22:11 53:13 54:11 107:6 122:17</p> <p>entities 65:15</p> <p>entity 14:17</p> <p>entry 54:11 92:3 93:2 105:23</p> <p>envelope 76:3 181:17 195:3</p> <p>environment 24:2 53:18 89:11 94:15,16 119:23 165:1</p> <p>environments 196:8</p> <p>envision 16:17 17:2,22 177:18</p> <p>equal 83:1</p> <p>equally 22:8</p> <p>equals 128:20</p> <p>equate 84:3</p>
---	--	---	--

<p>equating 47:21 48:4 83:10 108:8,19</p> <p>equation 60:19,24 90:24</p> <p>equations 80:4,6 117:23</p> <p>equipment 91:15</p> <p>equivalent 168:24</p> <p>e-rater 118:9</p> <p>eRater 33:14</p> <p>e-Rater 29:3</p> <p>error 46:1 47:14 48:13 51:4 153:3,5,6 156:15,18 160:7,11 162:5,10,13,16</p> <p>especially 17:13 75:20 87:6 147:12 149:22 186:24 201:14 205:22 223:10 224:10</p> <p>essay 25:19 27:7,11 28:2,21 29:3 30:18 34:21 35:1 39:2 40:20 43:24 59:2 70:16 77:2,16 78:22 82:17,24 83:10,12,17 85:4,5,8,15 90:12 95:9,19 98:17 99:23 100:2,6,11 101:16,18,19 107:8 110:18 113:13 114:24 115:4,9 132:22 134:23 136:22 139:4,5,23 144:21 145:9 146:23 148:12,22 155:19 161:15 165:24 173:3 181:17,18 183:6,9,11 188:15 189:15</p> <p>essays 27:19 31:23</p>	<p>33:19 34:2,5,6,10,12 40:21,23 46:2 54:12 56:8 76:10 77:1,4 82:18 83:3 85:13 102:8 104:19 111:4 113:16 117:23 118:8 134:20,21 136:24 137:3 144:12 146:13 148:15 157:13 182:24 183:3,5,9</p> <p>essentially 72:5 81:6,22</p> <p>establish 51:13 60:8</p> <p>established 13:24</p> <p>establishing 214:17</p> <p>estimate 219:5,6</p> <p>estimates 47:14 87:8</p> <p>estimating 84:1</p> <p>et 12:5 15:20 93:19 181:6</p> <p>ethical 120:3</p> <p>ETS 29:3 33:14 45:16 49:8,17,18 118:1</p> <p>evaluate 28:24 31:23 34:23 43:12 100:2</p> <p>evaluated 38:11</p> <p>evaluates 27:4</p> <p>evaluating 35:20 112:12 148:7 186:1</p> <p>evaluation 29:21 35:8 38:3,6,9 43:13 46:7 78:20 80:10 110:1 119:10,11 132:20 138:6,7 162:15 213:16 214:5,16 218:18</p> <p>event 115:21</p> <p>eventual 166:17</p>	<p>192:10</p> <p>everybody 5:11 11:21 57:23 97:10 98:14 127:2 143:20 149:22 221:12,15 223:6 224:20</p> <p>everyone 9:9,10 11:15 25:15,22 26:2,6 74:18 124:20 168:10 196:24 202:11 210:2,5</p> <p>everyone's 161:24</p> <p>everything 12:18 38:3 42:5 62:1 112:5 128:9 137:15 149:12 156:18 157:6 158:11 160:11 164:20,21 170:5</p> <p>everywhere 216:15</p> <p>evidence 13:1 72:15 119:20 164:13 176:22 177:8 178:22</p> <p>evidence-centered 13:2</p> <p>evolution 186:16</p> <p>evolving 192:1</p> <p>ex 203:1,14</p> <p>exact 30:20</p> <p>exactly 26:9 40:3 51:9 58:12 62:11 101:13 128:23 134:1 135:9 185:2,23 221:9</p> <p>exam 87:24</p> <p>examination 52:22 53:22 54:7 56:17,18 61:23 118:5,12 134:14 184:14</p> <p>examinations 53:3 55:11 57:5 118:16</p>	<p>examine 66:2</p> <p>examined 67:6 119:9,17</p> <p>examinee 53:20,21 54:19 131:24 134:11</p> <p>examinees 53:4 58:3,11 118:20 169:9</p> <p>Examiners 10:7 52:8,13</p> <p>example 31:18 32:22 34:17 62:14 65:21 66:4,7 67:8 69:4 73:12 83:5,7 86:16 95:9 97:5 98:16 100:19 123:19 132:10,11 137:15 141:18,21 144:23 179:20 180:22 183:2</p> <p>examples 69:3 112:7 179:14</p> <p>exams 88:1 217:22</p> <p>excel 134:15</p> <p>except 38:3 61:13,16</p> <p>excess 217:21</p> <p>exciting 224:4</p> <p>exclusive 178:3</p> <p>ex-colleague 73:17</p> <p>executive 115:17 215:10</p> <p>exercise 199:10</p> <p>exist 99:7 209:5</p> <p>existing 72:15 105:20 178:23</p> <p>exists 176:7 179:3 193:7</p> <p>expand 2:24 87:12</p> <p>expect 28:7 37:19 95:3 113:2 159:18 161:10 164:2 173:10</p>
--	---	---	--

expectation 14:4 79:20 124:16	explains 26:16	85:1,6,12 106:12 107:18 148:20 161:4 217:5,23 218:11	191:1,12 192:1 195:21 217:15
expectations 173:18	explicit 56:1 131:18 132:20 135:20 136:7 138:16	factor 110:17 161:19	federally 190:22
expected 11:10 61:1 124:11	explicitly 67:15 133:3 191:18	factors 141:14 152:18 163:3 200:4 202:17	feedback 8:1 12:14 14:20 17:13,20 18:6 27:14,17 28:1 33:8 34:18 35:22 40:18,22 63:18 74:13 85:8,10,17 126:10,15 136:16 137:1 138:1,3,15 139:7,20,21,24 140:13,14 147:11,15 148:11 149:6,9 150:19 156:5 158:1 159:9 170:21 209:19 220:14 221:3
expense 107:1	exploration 125:16	factual 121:2	feeding 87:22
expenses 56:21,22 107:12	explore 213:8	fail 57:5	feel 2:13 82:11 133:19 160:10 205:18
expensive 77:19 106:20 107:3,24 169:16 188:7 218:23	explorer 29:9	failure 201:6	fellow 54:5
experience 17:10 63:1 82:11 118:18 119:24 151:20 152:6 155:5 163:1,4,7 164:12 175:10 211:12,15	exploring 125:7,18 214:5 215:2	fair 4:3 91:7	felt 62:7
experiences 52:17 101:17 120:5 214:15	export 123:17	fairly 44:17 56:11 81:2 107:3 110:22 111:14,17 138:12,14	Ferdinand 29:11 132:11
experiment 182:17	expository 65:22	Fairness 119:13	Ferrucci 42:11
experimented 91:2	express 101:22 104:2	faith 134:7	field 6:20,21 25:2,14 41:6 71:5 72:7 97:13 99:8 116:15 125:9,23 171:9 186:6 190:6 205:6 214:4
experiments 73:5,10	expression 213:14	fall 134:6 167:5 191:24	fifteen 72:8 146:8 194:8
expert 49:16 53:6 55:8,15 128:2,21 129:1,2 130:8,15 132:1 161:12 196:20 198:14	extend 39:18 117:21	fallacy 44:6	fighting 216:6
expertise 3:1 4:24 197:5	extended 117:22 157:14	falsely 218:4	figure 41:6 54:5 78:12 157:22
experts 2:17 3:5 4:23 5:17 6:13,20 11:1,12 26:3 56:1 60:11,20 82:7 100:21,23 129:23 130:24 131:3,16,18,22 133:5,13,24 197:3 200:11,18 209:23 223:9 224:11	extension 121:5	familiar 66:22,23	figured 122:7,20,22 133:24
explain 56:5,6 71:18 122:19 141:22 202:10	extensively 25:18	familiarity 57:21,22	figures 117:24
	extent 4:19 59:3 139:23 153:24 191:7	fascinating 48:2	file 61:15
	external 119:12	fashion 193:18 214:19	filed 216:7 218:16
	extra 61:20	fast 140:23 207:4 209:1 218:12	
	extract 105:4 189:22	faster 92:16	
	eye 196:23	fatigued 196:24	
	eyes 192:16	fault 180:12,13	
	<hr/>	FCAP 83:19	
	faced 140:10 153:18	fear 194:19	
	facets 46:8	feasibility 125:8,15 204:4 206:4	
	facilitate 9:7 12:4	feasible 21:16 120:1 153:18	
	facilitated 45:18	features 66:3 149:4 181:5	
	facilitator 211:12	federal 2:15 8:24	
	facing 139:22 218:23		
	fact 36:13 45:14 49:20 59:11		

fill 122:17	fix 96:17 165:21 166:4 187:16	Foreign 118:13	framework 199:20
final 59:7 79:16 86:19 115:3 138:1 192:22 224:13	fixed 87:3 129:8 166:7	forget 46:24 52:5 76:21 174:16	frameworks 46:5
finally 115:6 124:10 218:21 225:8	flag 37:2 161:11	forgiving 85:3,9,14,17 131:17	framing 195:12
financially 226:12	flattens 145:6	form 53:14 58:12 81:22 119:1 148:22 201:8 223:16,17	frankly 217:17
finds 28:18	flavor 33:16	format 26:10 57:1 58:20 125:17 127:21	free 54:21 82:11 194:5 222:19
fine 62:1 188:17 204:23	flexibility 155:5 157:9,22 192:5	formative 12:19 14:10,13 15:18 18:7 35:4 63:5,18 123:21 124:11 139:20 147:20 152:23 153:5 159:11 198:17,21,23 199:7 218:11 220:2,6,16,17	freestanding 72:6
fingers 92:18	flexible 14:19 17:23	formats 26:7 94:21 186:7	free-text 54:11
finish 61:12	flip 170:14	forms 123:22 191:16	Friday 1:12
finished 120:20	Flora 9:15	formula 105:5,13 190:24	front 45:13 84:9 126:6
finite 79:14,19	Florida 83:6 97:24 207:17	forth 17:10 56:24 84:21 102:14 122:20 129:24 132:11 175:14	fulfill 175:10
first 2:3 4:16 22:16 34:6 42:5 52:20,24 56:13 61:15 65:23 76:19 87:19 114:11 118:8 128:5 129:17 137:15,17 139:8 144:14 147:10 150:10 152:14,20 155:24 160:9 179:6 182:22 201:10 207:10 211:4,10,13 214:17 223:5	flow 5:11 46:6 49:1 157:18 158:5	forthcoming 2:9	full 4:3 13:3 128:3 161:23 202:23 214:1
first-language 66:5,9 67:7,9,17	flowed 157:15	fortunate 213:21	fully 3:23 182:20
fiscal 25:8	flowing 201:9	forum 211:10	function 89:4 96:4 97:1 101:14 107:6
fishbowl 5:18,22 7:16	flows 15:7	forward 5:5 20:23 115:15 184:19 194:5,11,20,22 205:24 210:8 212:16	functional 13:13
fit 36:15 43:4 155:18 196:12	fluency 32:12,16	foundation 2:13 9:16 14:13 26:14 102:21 125:3,7 192:23 197:14	functionality 12:11 166:2
fits 63:7 121:17	fly 61:17	founder 41:11	fundamental 208:16
five 19:22 36:4 38:20 41:3 48:17 59:23 82:4 114:1,8 127:2,23,24 128:8 131:23 197:17 202:7	focus 2:7 5:2,4 13:1,19 15:9 18:11 24:9,17 63:11 66:4 81:13 196:15 198:6	fourth 57:18 211:3	funded 190:11,22
five-minute 77:14	focused 2:4 18:3 31:13 79:12 109:21 126:18 138:8,9 203:17	frame 60:22 61:5	funding 167:18 190:14,15,24 194:3
	focuses 52:15		fun 177:17 195:21
	focusing 63:12 195:24 203:14		funny 132:7
	folks 36:21		fusion 16:7
	follow-on 203:20		future 5:1,3 6:12 35:15 91:18 134:9 192:9 214:18
	follow-up 124:6 209:8		futurist 26:15
	food 6:5		<hr/> G <hr/>
	force 93:8 194:15		gain 199:3
	forces 165:8		gallons 103:19
	forcing 131:4		game 134:14,15 135:15,19,23 144:22 151:21
	foregoing 226:3,5		

<p>198:23</p> <p>games 136:23 151:14,15,16</p> <p>gaming 135:10 144:11 145:13 221:7</p> <p>gangs 122:2</p> <p>gas 103:10,13,14,16, 19</p> <p>Gates 26:13 102:21</p> <p>gather 142:11</p> <p>geared 207:15</p> <p>Gee 28:6 120:10</p> <p>general 22:1 25:21 34:24 35:17 37:24 48:7,8 109:21 130:3,6,12 171:17,18 172:3 185:5 205:16</p> <p>generalized 138:22</p> <p>generally 48:10 85:9 91:4,7</p> <p>generate 39:5 174:24 176:21</p> <p>generated 30:5 141:5 214:18</p> <p>generating 31:15</p> <p>generation 23:13 116:17 120:24 149:12 189:6 193:5 218:22 223:17 225:3</p> <p>generations 182:20</p> <p>generic 214:10,15,24</p> <p>generous 2:12 59:13</p> <p>genre 110:15</p> <p>genres 173:7</p> <p>gentleman 148:18</p> <p>geometric 117:24</p>	<p>Georgia 11:2</p> <p>gestalt 131:7</p> <p>gets 28:22 33:8 36:14 87:1 97:16,17 106:24 107:10 157:15 183:9 199:9 206:11 208:1 210:17</p> <p>getting 12:4,24 14:5 19:7 41:18 45:5 72:8 86:14 98:8 99:2 101:12 102:19 103:22,24 104:9,10 113:18 125:22 133:18 145:19 157:8 167:16 174:4 175:11 176:15 186:20 215:22 223:23 224:15</p> <p>G-factor 83:23</p> <p>gift 2:12</p> <p>gigantic 59:10 61:19</p> <p>given 25:24 67:12 81:12 86:18 122:1,3 132:4 143:21 156:14 162:12 173:22 196:10 203:12 226:7</p> <p>gives 46:17 53:24 61:20 68:23,24 139:6 143:13</p> <p>giving 5:13 11:12,20 17:19 40:18 59:18 74:20 85:16 112:7 138:15 139:13,23 202:19 212:2 220:13 221:18,22</p> <p>glass 92:13 93:3</p> <p>glim 101:11</p> <p>global 138:7,9 222:2</p> <p>GMAT 118:10</p>	<p>goal 3:21 18:24 21:12 75:2 94:3 102:15 127:13 135:17 137:8 143:11,21 188:16 189:24 199:9 207:2</p> <p>goals 8:11 25:1 75:10 141:18 143:24</p> <p>God 150:9</p> <p>gold 35:19 48:18,20 200:18</p> <p>gone 96:14 103:10,11,13 104:4 127:10</p> <p>gotten 63:21</p> <p>governance 13:12</p> <p>governing 12:9,10 20:17</p> <p>government 8:24 190:24 191:1,12 192:1 225:4</p> <p>grab 126:14</p> <p>grabbing 198:18</p> <p>graciously 25:24</p> <p>grad 39:14</p> <p>grade 23:19 29:16 39:17 85:13 104:20 140:14 147:9 150:10 154:10,12 212:4,7</p> <p>graded 30:16 33:20</p> <p>grader 28:16,19</p> <p>graders 28:17 30:21 33:20</p> <p>grades 4:1 27:12 39:19 77:2 154:10</p> <p>grading 28:9 59:2 70:16,17 115:10 139:23</p> <p>graduate 71:21 118:9,11,12 168:1,8</p>	<p>graduated 150:8</p> <p>grammar 43:23</p> <p>grant 49:18</p> <p>Granted 122:21</p> <p>grantees 4:7</p> <p>grants 116:5</p> <p>graph 58:1 101:8 141:3,11</p> <p>graphs 117:23</p> <p>grappling 150:13 190:19</p> <p>GRE 118:12</p> <p>great 24:9 37:7 82:6 85:12 99:16 109:11 124:19 131:15 147:16 149:3 166:3 186:2 194:18 204:22 211:15,17</p> <p>greater 66:20 67:2,10 92:1 130:23 158:24</p> <p>green 15:20 20:1 114:4</p> <p>grid 137:12 153:23</p> <p>ground 168:22,23</p> <p>group 16:19,20 20:8 56:14,16 95:6 126:19 169:21 212:5 215:12</p> <p>groups 20:21 49:22 65:3 119:16 215:14</p> <p>grow 196:3</p> <p>growing 71:5,6</p> <p>growth 146:21 147:3 202:24 203:4 221:19</p> <p>GSEG 9:18,20</p> <p>guarantee 168:12 188:22</p> <p>guess 51:21 90:6 115:8,21,24 116:2 121:5 124:14 146:15</p>
---	---	---	---

home 34:20 69:14	huge 95:12	196:7 198:10	80:21 84:10 93:1
homogenization 116:9	hugely 218:22	210:7	176:6 178:2
hone 112:8	human 24:15 30:5	identifies 161:8	immediate 17:20
honest 74:23	31:12,20	identify 36:22	18:6,13 117:17
hood 165:5	46:9,10,13,14,15	81:3,4,6 122:18	154:18
hooked 156:8	,21,23 47:1,7	158:16	immediately 61:20
hope 14:11 43:1	51:12 64:6 73:4	identifying 138:16	103:8 158:13
122:24 124:14	78:16 79:9 81:6	idioms 49:22	190:5
192:2 194:24	102:5 112:1	IES 219:24	immense 73:13
hopefully 13:23	119:10,16	I'll 195:12	immensely 71:5
14:24 41:22	141:14 145:1,5	Illinois 1:17 10:5	impact 125:8
125:24 172:7	153:11	121:2,4 217:23	148:3 161:15
195:3	154:4,5,14,16	222:20 226:22	218:15
hoping 48:3	156:13,19	illustrate	impacted 108:16
164:12 212:16	158:4,7 160:21	146:10,11	impacts 108:9
host 2:11 27:5	161:1,6,18 173:2	I'm 6:3 9:5,14	impairments
30:12 149:14,21	179:19,20	10:12,22,24	212:9
hosting 209:14	187:18 213:16	11:22,23 24:7	implement 46:5
223:22	humans 63:23	26:7,9 29:14,18	127:19 133:23
hotel 126:23	161:10	34:16 39:14	164:24
hour 56:21 75:2	hundred 23:19	40:13 47:11	implementation
hours 55:15 59:12	47:13	48:9,21,22 49:13	119:18
122:1 180:13	hundreds 107:9	51:3 57:9 61:7	implementations
184:4	180:13 182:19	62:12 64:4 70:8	118:11
hour-to-hour 48:2	husband 29:8	71:17 72:8 81:15	implemented 3:23
house 69:14	hyperbole 37:8	83:13 86:8,9,14	123:14
Howard 10:19	hypernyms 73:2	91:22 92:4 97:23	implementing 5:5
41:2,10,16,17	<hr/>	100:15	118:23 218:21
42:1 50:10,14,20	I	104:18,19,20,24	implications 150:5
51:3,23 75:23	IBM 42:7,11	105:2,12 112:12	import 123:17
79:24 80:12	IBM's 42:10	115:17,23	importance 79:19
85:21 86:8	icons 54:6	121:12 123:12	important
87:11,13 88:22	idea 20:12,22	125:14 128:8	20:11,13 21:3
89:15,21	21:4,13,19 22:1	136:5 139:13	23:4 31:22 32:2
90:3,9,16	24:23 61:3 79:2	140:23,24	45:6 57:8,9 59:5
95:4,20 105:22	121:13 126:19	143:21,22 147:9	69:8 82:22
112:1,15,21	145:16 149:12	152:11 159:21	132:23 134:10
113:21 127:8	155:1 163:1	164:15 172:9	138:12 147:12
152:13 159:1	165:10 168:5	177:16 182:22	153:9 155:12
183:13	176:17 178:24	187:9 188:21	161:7 164:16
204:10,12,19	187:3 192:23	190:3 195:11	176:13 177:7
205:4,14,21	197:22 198:2,22	196:23,24	182:1,7 184:13
206:13,18	200:9 203:8	197:12	200:13 201:1
207:4,7	206:9	198:14,17	220:20 222:13
Howard's 162:1	ideal 34:8	201:21 202:11	importantly 20:14
hub 14:9	Ideally 175:1	205:6,24 207:10	impossible 55:13
	ideas 5:19 20:14	208:5 213:2	71:18
	32:11 35:3 74:20	215:6,9,10,13,14	
	75:3,5 127:19	217:4	
		imagine 13:13	
		42:17 66:13	

<p>impressions 202:2</p> <p>improperly 219:9</p> <p>improve 13:19 85:5,6 136:17 137:2 138:4 154:23 192:3 220:14 221:4</p> <p>improved 99:7 168:6</p> <p>improvement 3:15 168:16 206:12</p> <p>improving 111:2 112:13</p> <p>IMS 222:2</p> <p>Inaudible 208:22</p> <p>incentive 125:20</p> <p>incentives 197:15 206:3</p> <p>include 3:12 27:5 117:22 127:18</p> <p>included 140:2</p> <p>includes 52:14 118:2,7 206:20</p> <p>including 2:7 3:12 31:3 118:20 121:9</p> <p>inclusion 225:2</p> <p>inconsistent 187:19</p> <p>incorporate 149:16 158:23 159:2 175:8</p> <p>incorporated 35:5</p> <p>incorporates 29:24</p> <p>increase 57:13 206:16</p> <p>increased 18:11 94:21</p> <p>incredible 207:15</p> <p>incredibly 36:24 169:15 183:24 187:12</p> <p>independent 60:18 69:7 110:19,20 111:16 156:1,4</p>	<p>170:24</p> <p>independently 156:12 213:11</p> <p>in-depth 22:24 60:3 75:3 126:3</p> <p>India 77:3 78:4</p> <p>Indian 29:8</p> <p>Indiana 11:9 91:2 106:3</p> <p>indicating 123:20</p> <p>indications 221:18</p> <p>indicator 66:23 222:16</p> <p>indicators 46:6 206:12</p> <p>individual 3:18 16:21 32:24 42:18 46:23 48:6 55:9 58:13 105:10 107:2 109:17 144:3 155:2</p> <p>individually 12:16</p> <p>individuals 12:3 114:2 201:17</p> <p>induce 197:15 198:12 203:16</p> <p>industry 175:22 194:21 202:1</p> <p>inevitable 216:12</p> <p>inexpensive 107:10</p> <p>infant 39:15</p> <p>infect 41:20</p> <p>infer 122:19</p> <p>inference 101:19 141:23</p> <p>inferences 85:15 101:15 180:2</p> <p>inferring 140:6</p> <p>inflated 48:15</p> <p>inflexibility 116:10</p> <p>inform 3:15 115:7 193:20 201:2</p>	<p>220:13,19,23</p> <p>information 2:10,18 3:10 8:12 13:21 19:12 21:9,21 22:4 24:11,13,20 25:5 35:2 54:7 58:3 64:1 65:3,5,8,9,11,12, 13 67:12 69:1 72:24 73:1,2,3 126:8,10 137:8 141:12 142:1,4,11 143:14 147:24 148:20,21 156:3,5 157:24 172:18,22 174:4 175:11 182:14 188:14 196:17 197:7,9 204:20 209:2,10,24 210:11 211:18,22,23,24 212:1,3 220:22 225:4</p> <p>informative 142:15</p> <p>informing 104:3 220:16 222:15</p> <p>infrastructure 86:15,23 211:24</p> <p>infrequent 66:13</p> <p>inhibitor 145:23</p> <p>inhibitors 92:21</p> <p>initial 53:9 61:14 75:13 108:10,12 113:5 126:7</p> <p>initially 75:17 120:1</p> <p>innovation 23:11 125:17 206:15</p> <p>innovations 21:15 219:22</p> <p>innovative 22:19 23:24 57:21 88:1 125:24 196:5</p> <p>input 7:7 13:5 225:9</p>	<p>insanity 216:17</p> <p>insensitive 77:6</p> <p>inside 52:11 73:20</p> <p>insight 41:14 133:24</p> <p>instance 205:10</p> <p>instances 133:2</p> <p>instant 150:18</p> <p>instantaneous 147:11,15</p> <p>instantaneously 33:9</p> <p>instead 73:23 137:1 149:23 208:11</p> <p>institute 10:23,24 184:16</p> <p>institution 216:15</p> <p>instruct 79:9</p> <p>instruction 14:16 23:22 32:14,19 35:5 63:6,12 93:23 94:6 115:7 136:14 145:17,24 149:20 150:7 151:12 152:24 193:15,21</p> <p>instructional 3:11 33:9 114:19 151:6 152:6 159:9 191:8 212:13 220:17</p> <p>instructionally 3:8</p> <p>instructions 78:14</p> <p>instructive 115:19 220:14</p> <p>instructors 144:12</p> <p>instructs 78:24</p> <p>integrate 86:20 88:4 113:6 114:20 115:3 145:24 150:6 152:16 193:15 195:20</p> <p>integrated 12:17 23:16 80:8</p>
---	--	---	---

<p>145:16 149:20 151:20,24 175:8 193:18</p> <p>integrating 86:10 93:23</p> <p>integration 12:18 94:3,6 158:19 159:2</p> <p>intelligence 36:12 64:15 79:21 81:16 102:11,16,18 106:7 125:10</p> <p>intelligent 10:23 29:3 136:10</p> <p>IntelliMetric 29:4 33:15</p> <p>intend 161:5</p> <p>intended 179:11 184:18 185:1,2 212:19</p> <p>intensive 56:24 131:21</p> <p>intent 193:23</p> <p>intention 12:16</p> <p>intentions 52:9 200:23</p> <p>interact 16:22 42:19 53:5 57:4 142:14</p> <p>interacting 143:23 198:11</p> <p>interaction 80:9 113:8 143:7,10</p> <p>interactive 82:14 93:15 136:11 158:12</p> <p>interactively 80:5</p> <p>inter-cooperative 142:9</p> <p>inter-correlation 130:13</p> <p>interest 53:14 79:18 112:16 135:21 136:1</p> <p>interested 2:20 24:21 39:14 90:7</p>	<p>143:22 145:6,7 169:3,5 205:17 224:15 225:6 226:13</p> <p>interesting 26:24 40:6 76:1 92:19</p> <p>Interestingly 129:15 130:12</p> <p>interests 39:13 197:10</p> <p>interface 54:24 59:3 80:15 90:18,19 92:7,8 140:12</p> <p>interfaces 80:12 92:10 118:4</p> <p>interim 12:20 14:19,20 15:21 17:17,22 18:1,2 134:4</p> <p>internal 64:21</p> <p>international 121:18,22 122:8</p> <p>interoperability 4:17 222:3</p> <p>interoperable 23:17 170:5 222:13</p> <p>interpret 122:14 152:12</p> <p>interpretability 177:11</p> <p>interpretable 177:14</p> <p>interpretation 46:16</p> <p>interpreting 80:16</p> <p>interrelated 137:16</p> <p>intervals 15:21</p> <p>intervening 149:1</p> <p>interventions 212:21</p> <p>interviews 209:15</p> <p>intimidating 163:13</p>	<p>intro 11:20</p> <p>introduce 9:12</p> <p>introducing 198:6,9</p> <p>introduction 7:2 65:24 139:13 140:4</p> <p>introductions 9:10</p> <p>invest 98:12 176:9,14 192:2,3 203:22</p> <p>invested 29:2 98:16 99:15 193:4</p> <p>investigation 216:10</p> <p>investing 107:16 201:18 205:2</p> <p>investment 98:21 99:1 201:8,20 203:17,21 204:19 208:8</p> <p>investments 38:19 166:12</p> <p>invite 209:23</p> <p>invited 4:22</p> <p>invivo 142:9</p> <p>involve 116:14 186:24</p> <p>involved 13:7 19:9 131:8 151:16,17 168:4</p> <p>involvement 13:4 16:20</p> <p>involves 144:1</p> <p>involving 13:17 142:16</p> <p>iPad 91:18 92:9</p> <p>Ireland 77:3 78:4</p> <p>irrelevant 57:23 137:24</p> <p>Isabella 29:10</p> <p>ISAT 216:4</p> <p>ISBE 167:5</p> <p>isn't 36:17 71:16 73:20 125:19</p>	<p>173:12 188:5 221:18</p> <p>isolate 73:19 79:6</p> <p>isolated 16:23</p> <p>issue 17:13 39:11 51:11 52:12 57:10 101:14 104:16 165:12 181:23 182:12 207:13 217:19</p> <p>issues 3:2 5:18 16:8 39:2 51:21,23 57:13 58:19 84:21 86:23 93:1 98:14,20 109:4 139:11,22 150:12,15 154:11 165:16 180:15</p> <p>iSTART 136:11 137:12,13,15</p> <p>item 11:24 14:21 15:3 16:5 17:1,8,10,19 19:7,8 22:19 23:23,24 27:4,5,8 44:6,10 82:15 83:4 105:19 118:19 154:6,21,22,23 155:2 158:20,24 162:21 170:20 171:1,6,16,18,23 172:1,8 174:1,20 175:9,18,21</p> <p>items 13:8,9 16:6,8 17:3,4,7,14,18 18:16 19:7 22:11,17,18,21 37:15,17 44:7,8 45:3 56:19 57:12,14,20 59:9 82:4,16 83:11 87:20,22 89:21,22 90:5 95:3 106:4,6 108:6 117:18 121:7 122:12 153:9,22 154:20 155:20 156:11 157:11,14</p>
--	---	--	--

164:12 165:15 170:8,15 171:14 172:20 174:10 176:18 181:22 183:2 186:17 187:17 188:3 190:7,8 191:13,17 192:7	113:1 166:2 176:2,23 jobs 216:22 218:18 Joe 11:2 24:7,8 93:11 114:13 123:9,10 192:12 193:2,23 John 10:17 37:12 38:12,16 79:11 80:11 91:8 109:1 120:13 162:18 163:24 164:6 174:17 190:10 191:3 194:2 208:1 224:5 John's 165:3 joined 18:21 journey 211:16 judge 122:8 judging 123:4 judgment 46:24 47:7 131:7 154:4,7 160:13 161:12,15 164:22,23 186:24 Julie 210:24 215:5,9,10 219:14 jump 8:5 82:7 161:23 207:9 June 1:12 justify 102:5 juvenile 122:4	Kevin 10:15 11:21,22 165:2 key 3:2,4 4:14 5:19 13:18 17:13 19:6 29:17 31:9 41:8 60:12 64:3 69:19,21,23 95:16 103:15 142:5 144:4 196:1 keyboard 92:17 93:3 keyboarding 39:17 40:2 keys 133:9 kick 19:19 25:23 kicked 152:12 kicking 125:15 kid 30:15 93:6 146:5 149:7,9 kidding 47:12 kids 27:16 50:1 76:19,21 77:18 92:14 93:5 94:10 108:15 113:16 114:23 144:13 145:20 146:9 147:17 151:15 154:10 175:13 207:20 kid's 146:21 Kids 189:3 killer 205:21 kinds 43:20 76:9 98:20 103:23 108:19 109:18 110:8 143:16 145:23 148:21,24 153:2,9,10 154:8 157:14 164:17 169:10 181:13,14 201:5 203:10 214:2 King 10:15 11:21,22 29:8 165:2 kludgy 77:13	knew 43:19 knowledge 3:1 4:5,23 24:3 70:9 88:8,9 101:16 141:20 143:1,8,10,17 144:2,4 163:8 knowledgeable 149:24 known 27:23 83:21 134:20 200:11 201:20
<hr/> item-writing 170:19			
<hr/> J <hr/>			
Jackson 210:24 219:18,19,20 Jacqui 9:19 Jane 9:22 Jason 125:14 195:5,12 196:19,22 202:14 204:6,11,14,22 205:9,18,23 206:22 207:6,24 209:9,21 210:2 Javascript 92:24 Jennifer 10:8 23:7,9 50:19,20 51:15 94:19 174:17 177:15 Jennifer's 51:4 95:15 Jeopardy 42:8 jerry-rig 175:23 Jesse 10:17 37:12 38:12,16 79:11 80:11 91:8 109:1 162:18 163:24 164:6 190:10 191:3 194:2 Jim 10:4 22:5,6 36:10 75:15,16 77:21 78:2,6 89:10,19 90:6,11 91:8 111:24 113:21 142:22 167:3,4 174:17 181:21 job 35:20 37:7,11 44:2 45:17 46:3 80:16 110:9	<hr/> K <hr/> K-12 52:10,11 57:9 120:18 Kansas 9:18 207:11 208:15,18 Kathleen 45:1 80:1 Kearns 9:19 Keith 31:7 Ken 114:11 115:16,17	<hr/> L <hr/> L.A 196:23 L1 66:9 lab 142:15 146:6 labor 131:20 206:19 Labs 32:11 landscape 197:20 198:8 202:24 Lane 1:15 language 2:8 3:12 4:1 18:4 24:5 27:17 49:22 63:3,14,20,23 64:1,7,11,18,19 65:11,16,18 71:19,24 72:1 79:12 109:6 118:13,21 136:7 149:8 155:15 225:3 languages 27:14,15 63:23 148:11 149:6 large 49:5 56:15 57:15 58:2 59:9 65:9 82:15 96:10 113:15,17 124:8 125:13 152:17 186:13 212:11,14 largely 57:12 68:9 73:4 larger 42:16 124:1,2 204:1 205:3 224:3	

large-scale 47:22 167:6	85:14 128:9 130:4 134:17	letters 215:22	lines 18:20 22:23 64:14 98:22 178:18
largest 81:12 82:18	learner 145:23	letting 152:13	linguistic 44:4,16 45:16 148:10
last 62:20 65:7,23 74:9 101:11 107:21 112:17 116:3 123:9 133:21 134:5 146:23 151:2 152:8 161:13 194:24 203:3 219:18 221:23 222:17 224:13	learners 2:8 3:13 24:6 27:16 118:21 155:15 225:3	level 11:15 17:24 25:16 37:14 70:24 76:15 83:12,15 84:1 88:23 89:2 107:2 110:15 127:14 143:15 151:19 152:5 154:3 158:8 181:2,3 211:13 212:4,7	linguistically 67:16
late 31:6	learning 3:15 9:18 10:24 13:20 29:4 58:19,23 64:6 116:7 187:22 188:1 196:6 197:3 211:6 220:19,23 221:8,22 222:2,3,5,15,24 225:7	levels 15:11 21:20 71:2 83:3 87:16 89:4 92:24 153:2 154:10 180:23 204:20	linguistics 66:10 168:3
lately 62:13 112:17	lease 167:9	leverage 154:24 156:10 203:16 208:8	linguists 169:22
latent 63:3,14 67:19,22 71:20,23	Leason 114:12	lexical 64:24 66:11,20	link 137:7
later 19:15 53:11 55:23 60:4 61:11,23 118:17	least 18:13 33:20 55:23 62:21 98:17 107:11 131:19 147:24 153:18 157:11 165:11 186:1 189:23 201:2,4 222:17 224:18	license 61:23	linking 14:24 16:19 218:17
Laughter 191:2	leave 113:24 143:2	licensing 52:22 53:3 87:24 89:8 184:14	list 59:7 114:8 121:16
launch 144:10	leaving 14:6 15:12	licensure 118:6	listed 8:4 152:18
law 203:1 217:15	led 42:11	Lifetime 198:2 202:18	listen 42:11
lay 41:3 104:13,18 175:17 197:20 200:22	left-hand 114:3 210:15	lifetimes 194:12	listening 123:13
layered 48:5	legislation 150:20	light 7:20 20:1 187:1	lists 65:4
lays 159:19	legitimacy 139:8	likelihood 111:15	listserv 225:6
LDA 211:9	leisurely 18:24	likely 36:13 59:2 129:7 132:23 214:3	literally 202:10
lead 17:9 45:7 121:5,6 192:18 196:20	lend 153:21	likened 110:2	little 5:13,23 6:11 13:23 15:5 22:24 23:1 26:19 29:20 34:17 35:6,24 45:3 46:11 49:24 52:9,22 60:7 74:24 75:2 86:2 92:15 94:24 96:1,22 101:11 104:15 105:14,18 106:16 107:17 114:3 125:4,20 126:3 136:6 139:14 144:22 147:22 153:5 158:21 160:4 163:12 165:3 177:22 183:10 186:11 187:2 194:7 195:11,13
lead-in 200:23	length 18:12 139:8 145:3,4,5,7 148:12	limitations 105:24 70:12 105:19 106:10 205:5	limited 49:7 163:7 206:15
leading 206:12	less 66:22 67:1 96:22 142:15 153:20 168:12,23 174:10	line 67:14 76:11,14 166:15 177:13	living 26:17
leap 134:7 194:5	let's 109:3 146:2 159:3 200:6	linear 145:3	
leaping-off 202:6	letter 76:7		
learn 49:7,23 50:2 75:6 115:19 136:13,20,22 151:16 184:12,15,20 198:24 211:18 221:4			
learned 52:23 75:1			

lo 103:6	171:20,22	lunches 6:6 126:22	107:12 108:2
local 2:4 150:17 223:24	176:18 177:4	lying 66:1	109:11 144:8,9
locally 138:9	179:1 182:6	<hr/>	150:24 151:11
location 54:9	184:15	<hr/> M <hr/>	152:7 154:21
locked 168:23	187:13,16,21	machine 27:10	158:15 164:9
log 94:5	193:16 197:4	46:10,12 47:17	165:19 167:16
logarithmic 145:3	199:16	50:23 51:1,9,11	172:21 174:22
logic 119:3	205:16,19	64:6 91:13	178:2 187:9,23
logical 35:14 128:18	211:22 215:23	machines 27:9	188:8 198:22
logistically 55:19	lots 57:3 84:11	main 35:3 131:12	207:9
long 10:13	91:19 122:2	144:15,16	market 95:23
20:3,5,6 24:23	131:22 148:20	mainly 64:16	201:6,12 204:24
45:4 57:11 61:3	177:4 188:4,6	maintain 96:15	205:1,2 206:2
62:3 97:9 99:9	Lottridge 127:10	maintenance	207:23
100:18 106:23	152:9,10 160:2	96:21,23 105:15	marketplace 100:8
107:11 114:23	163:21 164:1,9	major 13:18 14:8	125:19 199:18
151:2 169:1	166:16 170:17	16:2,5 44:18	203:19 204:1,7
183:24 185:4	171:11 172:17	97:18 113:1	205:12 206:12
187:20 189:20	174:8 190:2	165:23	markets 203:24
195:6 196:10	192:4	majority 202:21	Markmiller 26:13
longer 23:1 27:19	loud 41:22	majors 64:20	102:21
40:23 50:14	Louisiana	man 54:3	Mark's 132:10
77:23 145:6	89:12,15 160:6	manage 58:22	Marxist 183:15
224:19	love 90:21 105:23	157:18,24	mastery 145:11
loops 76:11	210:20 219:11	158:10	match 200:11
lose 129:8,10	Lovell's 87:21	management 25:9	matched 143:19
lost 103:1 194:19	low 59:17 69:12	118:10 222:5	matching
lot 25:20 26:21	70:1 132:13	man-machine	143:23,24
40:5 44:4,14	156:15 179:1	42:23	materials 57:11
45:12 46:14 48:5	184:7	manner 55:20	58:7 116:18
49:7 50:7,15	low-achieving 4:6	79:22 179:4	math 80:3 81:1
57:22 63:2 65:6	low-cohesion	182:13	89:16 90:12,24
72:19 73:18 75:1	141:23	manual 155:18	104:19 109:6
77:13 79:12 84:6	lower 31:20 89:2	map 20:18 146:21	121:21 122:15
96:8 99:16	130:14 154:10	Maps 9:18	167:12
104:10 106:24	low-income	Maria 29:7	mathematic 121:9
107:4,20,24	222:19	Mark 10:11	mathematical
108:24 110:20	LSA 64:5 65:5	25:12,13,17 26:5	79:15 105:5
113:4,5 117:11	67:24	36:3,6,19 37:20	121:23
126:22	68:7,10,11,13	38:14,18 39:12	mathematics 4:1
128:12,16	69:3,9,20,21,24	40:9 41:4 43:19	79:13 120:12,14
129:12 131:3,4	70:1,2,5,9,13	44:1,20 45:19	121:10 154:2
132:1 142:11	71:5,8 72:5	46:3 76:18 77:24	220:6
143:21 144:12	73:6,7,9	78:3,13 82:13	matrices
154:5 156:21	137:14,23	85:21 91:1 92:6	68:19,20,22,24
159:4,22 165:4	lunch 6:2,3 7:4,14	95:20 97:14	matrix 68:12
168:1 169:2,18	74:11 124:23	99:10 102:17	matter 79:3
	125:1 126:21,24		
	222:19		

<p>mattered 220:8</p> <p>matters 111:19</p> <p>Max 114:12 120:9,10</p> <p>maximize 4:17 144:19</p> <p>maximum 4:19</p> <p>may 18:1 21:14 32:2 37:7 69:12 95:20 110:8 112:22 119:24 147:14 153:6,11 156:16 161:17 162:11 166:24 170:24 174:12 175:3,5,21 177:22 186:16 189:22 192:8 194:11 195:17 200:18 209:18 218:14 225:9</p> <p>maybe 36:16,17 37:8 50:12 76:12 78:18,19 83:23 88:20 90:5 95:1 112:18 123:3 131:4 163:15 175:6 178:16 187:23 189:6,17 202:1 203:7 207:17 213:7</p> <p>Mayor 222:21</p> <p>MC 10:21 40:14 63:9 71:22 72:23 80:17 84:23 94:14 96:1 101:7 110:17 120:10 135:8 136:5 143:6 167:17 179:16</p> <p>McGee 114:12 120:9</p> <p>McKenzie 202:22</p> <p>McNamara 10:21 62:21</p> <p>mean 44:10 46:4 58:21 73:12 77:11 78:7 87:12 103:9 106:10 113:12 165:8</p>	<p>178:7 186:21 190:8 194:18</p> <p>meaning 65:1 119:4</p> <p>meaningful 67:1 180:5</p> <p>means 20:2 48:13 57:11 68:1 69:23 96:6 107:15 111:3 156:1 159:1 171:5 202:12 210:16 221:1</p> <p>meant 54:20 133:1</p> <p>Meanwhile 217:12</p> <p>measure 4:6 98:8 129:3 175:19 185:23 199:4 200:7,16 211:22</p> <p>measured 119:6 183:19</p> <p>measurement 183:15</p> <p>measures 13:22 16:21 60:18 114:20 115:3 119:6,8,12 125:12 218:5,8 220:7,22</p> <p>measuring 98:4,6 115:5</p> <p>meat 50:15</p> <p>mechanism 39:20,23 84:4</p> <p>mechanisms 31:23 34:16 109:18 110:5</p> <p>medical 10:7 52:8,13,21 93:12 184:15</p> <p>medium 87:20 88:23 111:17</p> <p>meet 141:17 189:22</p> <p>meeting 1:8,9 2:5,6,10 4:13,22 8:15,16,19 167:5 210:12 224:1,23</p>	<p>225:1,4,14</p> <p>meetings 2:3,12,21 78:10 131:2 223:23 224:24</p> <p>members 120:16 198:19 223:9</p> <p>memorable 57:12,16</p> <p>memorandum 12:10</p> <p>Memphis 10:22 62:23</p> <p>mention 17:21 29:20 51:4,16 56:10 216:11 221:7,23</p> <p>mentioned 18:10 23:9 24:17 37:22 45:20 61:3 62:22 77:8 90:16 93:11 102:20 115:4 124:3 126:13,19,21 137:13 140:17 150:6 158:15 169:7 172:24 180:8 191:15 205:9 224:22</p> <p>mentioning 98:14 108:11</p> <p>mere 121:1</p> <p>metaphorical 46:17</p> <p>method 72:4,6 117:13</p> <p>methods 47:4</p> <p>Metrics 10:20 41:11 49:11 90:7 127:11 152:9</p> <p>microphones 42:3</p> <p>Microsoft 43:23 77:12</p> <p>middle 14:9 34:12 197:18</p> <p>million 44:12 55:12 106:21,22 122:22 193:4 206:5</p>	<p>millions 97:24 98:10 204:21</p> <p>mimic 94:15</p> <p>mind 32:1 49:22 59:6,20 127:20 180:18 201:7 203:16 217:7</p> <p>minds 215:19</p> <p>mine 211:16 213:7</p> <p>minimum 3:24 33:12</p> <p>mining 64:5</p> <p>Minnesota 9:21</p> <p>minute 55:1 64:5 142:19 161:24 202:10 209:21 210:16</p> <p>minutes 6:8 7:18 11:20 16:14,19 19:22 25:13,24 26:1,2 27:1 36:4 41:3 50:12 52:20 53:23 59:23 71:11 74:4 111:23 114:3,8 117:14 125:2 126:2 127:23,24 128:1,8 195:6 197:9 202:7 210:14</p> <p>Miracles 176:9</p> <p>mirrors 217:22</p> <p>misconceptions 47:11</p> <p>miss 32:2</p> <p>missed 133:6</p> <p>Missouri 9:23</p> <p>misspelled 78:15,16</p> <p>misstep 163:13</p> <p>mistakes 221:5</p> <p>misuse 216:12</p> <p>misusing 219:9</p> <p>MIT 197:14,19</p> <p>Mitzel 10:19 41:10 42:1 51:3,23 75:23 79:24</p>
---	---	--	---

80:12 86:8 87:13 89:15,21 90:3,9,16 95:4,20 112:21 127:8 204:10,12,19 205:4,14,21 206:18 207:4,7 mix 44:3 modality 93:9 117:1 mode 86:11 model 17:18 33:17,21,22,24 70:9 72:16 89:9 91:3 110:13 151:9 153:10 156:13 157:8 159:12 160:5 163:12 166:19,21 198:17,19 203:15 208:5,16 214:9,10,11,13,1 7 modeling 121:9,23 models 28:15,20 35:17 37:24 105:20,21 122:5 145:8 157:23 163:9 174:14 214:16 modern 45:4 modification 22:15 modify 153:8 modular 23:16 222:12 modularity 156:7 module 88:22,23 modules 136:23 157:16,20 158:1 Mohamed 11:4 81:8,9,18,23 98:24 101:24 102:1 Mohamed's 162:15 moment 163:14	205:15 224:8 moments 7:1 money 2:15 78:4 96:4,5 97:6 98:16 108:8,18,19,20 169:18 176:14 194:13 201:7 203:15,18 205:2 monitor 155:16 156:19 159:15 160:21 161:3 monitoring 119:19,21 158:24 159:8 206:21 months 73:15 94:11 223:15 Morgan 125:14 195:5 196:22 202:14 204:6,11,14,22 205:9,18,23 206:22 207:6,24 209:9,21 morning 2:2 5:2,13 7:13 9:7,9 11:10,21 26:5 50:15 55:7 63:9 74:20 113:23 116:20 120:10 124:24 126:21 127:22 131:13 132:10 154:21 157:9 163:9 morph 43:8 mostly 222:7 motion 67:10 motivation 221:2 motivational 150:12,15 175:13 178:9 189:3 move 5:4 20:23 21:6,11 40:3,11 79:12 140:4 166:20 184:19 192:22 194:21 205:24 212:16	moved 194:22 moving 10:22 13:15 18:17 40:1 41:1 52:6 91:17 147:17 182:9 210:8 218:19 MRC 65:4 multimedia 146:6 multipart 155:20 multiple 13:21 16:5,7 17:3,7 22:12 23:24 27:5 33:11 51:16 56:18 83:4,8,13,17 86:18 88:19 90:3 104:24 147:1 149:6 154:2,13 157:10,11,21 159:4 178:13 179:12 182:24 193:12,24 204:21 214:11 218:5,7,8 220:7,22 multiple-choice 22:18 51:17 56:16 57:14,20,24 59:9 70:16 83:14,20 88:2,7 90:1 176:18 181:2,3,22 182:3,4 183:1,6,8,18,22 184:3 185:16 188:11,24 multiple-regression 33:22 multi-purpose 89:6 music 69:22 myself 117:13 174:16 <hr/> N <hr/> NAMARA 10:21 40:14 63:9 71:22 72:23 80:17 84:23 94:14 96:1 101:7 110:17	135:8 136:5 143:6 167:17 179:16 narrative 65:22 104:22 173:16 narrow 116:17 narrowly 169:4 nation 121:5,6 224:4 national 9:20 10:7 52:8,13 64:17 115:18 120:18,19 121:14 122:20 150:17 216:18,21 223:24 natural 42:22 63:3,14,20 64:7 71:19,23 72:1 136:6 nature 17:23 141:10 navigate 118:22 NCA 49:9 NCLB 94:3 150:5,20 necessarily 72:21 209:6 necessary 23:12 119:21 necessities 218:24 negative 218:19 negatively 108:16 neither 226:8 net 65:4 nets 29:24 38:5 99:17 networking 221:8 neurological 212:9 neutral 92:2 nice 44:2 46:3 69:23 156:7,8 160:20 177:12 nicely 113:7 nicer 33:20
--	--	---	--

Nina 29:9	198:2,16	okay 62:18 74:17 103:12 113:21 134:5 136:5 137:24 151:1 175:1 192:24 196:22	7:6,22 21:17 74:10 123:11 124:21 135:23 151:4 154:20 168:14 193:10 194:3,4,9,11,18 195:1 215:17 224:6
nine 53:21 58:2 87:17,18 136:23	notions 73:21	old 72:8	opposed 186:18,22
nine-point 58:15	novel 57:20	one-minute 114:5	opposites 203:11
nitty-gritty 137:11	Novell's 87:14	one-on-one 211:19	option 153:17 189:5
Nobel 198:3	novelty 57:19	ones 89:7	options 126:22
nobody 159:19	numerous 222:7	one-shot 103:11	orange 16:1,3
non-corpus 214:9	nuts-and-bolts 123:15 127:19	one-time 194:3	order 18:15 23:5,10 54:7 58:11,13 72:17 135:22 139:12 174:4,20 210:13 211:1 220:14
none 44:8 167:15 184:6 192:11	<hr/> O <hr/>	ongoing 119:20 190:15	order-of-magnitude 168:15
nonetheless 132:13	Oak 1:14,17 224:10	online 23:20 25:6 33:2 208:19,20 219:12	orders 54:22
non-native 118:14	objective 31:4 125:22	on-the-fly 62:13	ordinary 37:1
non-overlapping 213:23	observations 50:17	open 3:4 8:21 14:19 36:7 43:6 44:9,17 128:3 134:10 135:3 156:23 165:12,16 167:21,24 168:6,14 195:13,18 203:24 211:9	organization 20:8 25:10 32:12 46:6 113:10
non-prescribed 15:21	obsessed 107:14	opened 72:7 192:15	organizations 223:24
nonsensical 28:21	obstacle 199:1,2	open-ended 22:12	original 31:16 83:24 106:19 128:14
non-standard 78:23 79:7	obvious 124:13	opening 54:2	others 36:5 75:18 109:20,22 118:17 134:7 149:14
non-summative 37:12	obviously 15:8 21:8,17 24:10,15 28:4 105:14 178:24	opens 84:20	otherwise 84:16,22 226:13
noon 7:14	occur 38:4 69:10,12,13,15,1 6	operates 90:18	ours 212:15
nor 8:24 220:13 226:8,12	occurred 132:12,13 201:10	operating 87:16	ourselves 6:16
norm 37:2	occurring 47:18,19 112:10 201:7	operational 69:18 196:11	outcome 135:21 177:7,9,10 184:17 226:13
normal 87:15	occurs 47:20 48:16 198:1	operational 53:2 119:20 165:1	outcomes 15:2 55:6 56:10
normally 94:7 115:21	o'clock 127:1	operational 37:5 53:1	outlined 191:12
norms 150:18	offer 130:17 151:9	opportunities 6:4 7:3 16:10 203:20 205:3 213:8	
Northwest 32:10	offered 151:4	opportunity 2:14 5:17,20 6:13	
notable 119:14	offering 12:17 212:20		
note 53:6 155:6 169:16 195:4	office 10:16,18 12:3 77:12 216:8 219:21		
notes 169:8	officer 9:15 226:3		
nothing 57:20 97:16 147:14 218:12	officials 218:9		
notice 29:12 76:2 139:18	Oh 40:13 133:3,5		
noticed 45:19 202:24			
notion 35:17 145:16 197:22			

outlines 15:15	197:19	Partnership 4:8	payroll 122:4
outperforms 46:14	paper-and-pencil 108:17	pass 195:12 196:19	PD 220:20
outside 6:7,21 52:10 101:17,19 156:2 161:9 194:16	papers 36:15 112:7 167:11	passed 61:22	Pearson 29:3 33:13 91:2
outstrips 206:3	paradigm 80:20 86:22	passing 169:8	pedagogical 141:18,20 143:24
overall 11:17 16:11 79:17 112:13 137:19 177:24 184:8	paradigms 194:5	paste 141:2	pedagogy 42:21
overcome 180:1	paragraph 68:17 139:12	pasting 150:3	peer-to-peer 196:7
overemphasis 216:12	paragraphs 68:3	Pat 25:7	penalize 78:19
overlap 65:15 68:1 69:9,24	parameters 73:7,8 159:15	path 81:13 106:3	penalized 93:17
overseas 104:7	PARCC 4:8 10:5,10,14 11:3,14,16 12:7 19:18 20:7,9 23:10 25:11 75:5,7 123:1 127:15 165:12 177:17 191:21	pathway 158:4 185:3	pencil 189:4
overview 5:10,14 25:14	parent 215:12	pathways 21:1 156:24 158:5	people 6:6 19:24 47:12,19 48:8 52:9,10,11,16 57:19 58:6,8,19 59:1,11 60:17 61:14,16,22 65:13 72:3 73:4 74:13 80:13 82:9 96:9,19 97:9 104:6 106:24 107:6 114:1 126:8 131:2,4 132:5,21 134:14,19 135:15,18 144:24 153:15,17 168:16 169:2,16 176:8,24 179:3 184:11,12,15 191:23 193:10 201:24 203:17 205:11,17,20 208:8 209:5,13,23 210:4,14 217:9 220:17
overwhelming 142:2	parentheses 90:23	patient 53:5,18,19	people's 7:24 87:8
overwhelmingly 218:19	parents 21:21 24:13 193:19 215:11,13,16,21, 24 216:23 217:21	patients 53:5 58:22 69:19	per 7:18 55:17 56:21 59:9 82:4 95:18 131:23 146:14,16 155:1 203:4
<hr/> P <hr/>	parent 215:12	Patrick 9:6,8 11:7 19:15,16 20:4,5 25:11 36:2 38:22 40:9 41:1 42:1 50:10 52:3 59:22 62:18 71:10,15 72:11 74:1,17 81:8,18 82:6 87:10 95:14 98:23 100:15 101:6,24 111:21 113:22 115:11 117:8 120:8 123:8 124:19 126:13 127:5 135:4 136:2 142:18 144:5 150:22 152:7 159:24 161:22 167:3 169:24 171:4 172:9 178:19 186:9 190:23 192:21 194:23 210:1 212:24 215:4 219:17 223:2	perceived 151:10
p.m 225:15	parent 215:12	pay 55:20 130:10 133:14 145:5 185:22	percent 22:9,22 23:19 26:16 36:20 37:10 47:13,15 76:13
P-20 121:2	parentheses 90:23	payoff 77:9 108:22	
Pacific 10:20 41:11 49:11 90:7 127:11 152:9 204:8	parents 21:21		
packets 87:2,3,21	parse 29:22		
page 76:8	parsers 29:1		
pains 54:4	participate 199:3 209:13		
Pal 136:20 139:2	participated 121:22		
Palmer 10:4 22:5,6 36:10 75:16 77:21 78:2,6 89:10,19 90:6,11 111:24 113:21 142:22 167:4 181:21	participating 20:17,20,21		
panel 11:1 128:2 200:11,17	particular 8:8 19:3 79:18 110:9 132:16 138:6 173:7,9		
pants 42:8	particularly 119:5 167:20 177:9 214:3,12		
paper 91:12 112:6 122:15 183:13	parties 24:21 226:9,12		
	partner 121:6		
	partners 124:6		

77:11 110:4,7 203:4 207:17 208:19 213:18,23	92:5 153:19	places 70:3,6 74:22 106:1	161:17 162:5 163:20 165:8,20 167:18 178:8,20 179:8,17 194:24 202:6 206:23 208:1 224:5
perception 93:24	persuasive 91:10 104:22 111:9,18 173:17,18	plagiarism 149:23 150:1 158:16 159:7	pointed 173:24
perfect 26:21 104:9 185:20 189:13	phase 193:8	plan 22:6,19 60:9 122:6 166:17 176:6 190:9 192:10,11	points 26:4 28:3,20 36:6 60:2,3 75:17 90:4 91:16 99:24 100:4,12 129:10,12 134:24 144:16 161:24
perfectly 51:8	phenomenon 34:3	planning 173:5	poking 107:20
perform 166:22 188:19	philosophy 81:14	plans 75:9 217:12	polar 203:10
performance 13:2 16:9,12,13,22 27:4,21 56:4,6,7 88:3,10 94:9 121:7,13 122:7 123:2 124:12,13,17 129:2 138:18 140:5 151:21 165:23 181:24 188:14 189:11,12,13 193:14 200:4 213:15 218:17	phone 102:24	platform 23:17 155:24 156:1,4,23 157:12,16,20 158:14 159:11	policies 56:2
performance-based 125:12 220:8 221:6	phones 8:6	platforms 4:18 157:21 186:18	policy 61:18 62:5,6 216:3,6,9 218:7
performances 21:7 60:21 124:15	photograph 76:8	play 96:7 136:23 173:8,10,13 174:2,5	political 66:3
performance-type 188:21	phrase 30:4	played 77:11	polysemy 73:3
perhaps 87:9 105:8 213:22	physical 54:7	players 96:5,7	pools 57:15
period 112:4,20 114:23 124:22 126:18 190:6 191:20 195:20	physician 131:21	playing 80:7 110:20	poor 28:24 41:17 177:3
periods 16:14 187:14	physicians 55:16 69:19 131:6	please 7:11 8:6 37:3 41:23 52:4 71:18 74:11 103:5 127:24 204:13 209:10	popular 32:9,18 91:19
PERKINS 226:3,20	pick 45:24 46:19 49:23 74:18 78:17 103:23 109:20 181:8 208:4	plenty 58:6	populated 72:14
persevere 121:10	picked 150:3	plug 222:12	population 58:2 81:12 122:22 135:12 145:19
persistent 120:2	picking 93:22	plug-and-chug 37:10	populations 39:5 49:4 108:15 118:20
person 7:18 52:6 89:1 95:18 132:4,14 211:3	picture 68:5	plus 4:11 132:21	portability 165:15
perspective 39:4	pictures 63:21	pneumonia 41:19	portfolio 27:20 33:4 34:19 92:23 148:16 149:3
	piece 18:9 42:7 57:7 63:7 105:10,11 122:10 157:4 159:13 161:7 171:8 221:23	point 11:8,10 21:6 24:20,24 45:14 46:1 58:3 76:5 78:7 82:12,23 84:24 85:2,4 86:19 92:20 95:15 99:2,13 100:4 103:21 104:5 105:3 129:8 131:19 133:16,21 134:5 138:1 145:5	portfolios 34:15
	pieces 15:8 16:2 17:11 21:3 72:15 87:17,18 109:8 151:5 162:23 170:23 172:1 179:6		portion 83:14,20
	pilot 25:3		pose 7:7 223:13
	piloting 19:8,9		position 8:7 58:14,18 116:24
	Pinta 29:9		positive 53:10 55:6,21,24 56:10 91:4
	pioneer 47:4		
	pioneering 121:7		
	piqued 112:16		
	placed 70:7		
	placement 43:18 147:16 183:17		

<p>positively 138:14</p> <p>possibilities 156:23</p> <p>possibility 62:13 125:8</p> <p>possible 19:13 22:14 28:21 37:19 38:13 39:22 62:9,10 84:16 94:16 104:21 154:18 166:24 172:19 186:16 191:7 215:8</p> <p>possibly 23:1 25:1 82:20</p> <p>postal 76:1</p> <p>posted 208:9</p> <p>posting 8:14 209:17</p> <p>pot 194:13</p> <p>potential 57:2,18 59:7 62:16 79:5 117:16 119:17 186:5,15 195:17 201:19 203:23 220:3</p> <p>potentially 80:6 92:3 191:18 193:22</p> <p>powerful 13:13</p> <p>PowerPoint 224:14,16,19</p> <p>practical 55:18 70:12,14 86:13</p> <p>practice 3:11 41:15 58:8 63:17 93:18 94:18 136:23 144:13</p> <p>practices 121:1,9 220:12,13,24</p> <p>practitioner 41:12</p> <p>practitioners 2:19 191:16</p> <p>Praxis 118:15</p> <p>preceding 16:9</p> <p>precision 18:11</p>	<p>209:12</p> <p>predict 101:20 129:1 139:11 174:12</p> <p>prediction 31:5</p> <p>predictions 34:4 36:12</p> <p>predictive 221:17</p> <p>predictors 145:10</p> <p>predicts 183:5,8</p> <p>prefer 117:12</p> <p>preferences 206:23</p> <p>preparation 14:5 151:4</p> <p>prepare 58:7</p> <p>prepared 117:14 170:11 212:1,18 217:6</p> <p>preparing 90:15</p> <p>prepping 94:10</p> <p>pre-processing 64:24 72:3</p> <p>preprogrammed 24:4</p> <p>presence 35:2</p> <p>present 5:19 6:13 8:22 26:10,16 141:8 150:2 194:11 213:8</p> <p>presentation 11:14 19:18,22 23:8 25:23 26:8,13 40:12 50:9,11,16 62:20 63:2 136:4 141:11 144:7 152:8 162:2 211:7 224:19 225:4</p> <p>presentations 41:2</p> <p>presented 35:11,12 41:5 75:4 78:9</p> <p>presenters 74:19 75:4 81:10 127:22</p>	<p>presenting 141:12</p> <p>presently 27:20</p> <p>president 30:4 219:22</p> <p>press 165:2,11,14</p> <p>pressure 61:19</p> <p>presumably 168:5</p> <p>pretty 26:23 29:17 30:19 77:15 93:4 99:18 100:13 102:19 103:22,24 106:18 107:10 109:24 130:15 163:1,2 167:14 171:23 183:18 195:22 211:20 223:8</p> <p>preview 8:17</p> <p>Previous 119:13</p> <p>price 56:11 57:2,8,18 59:7 94:20 133:14 200:3,14</p> <p>prices 95:22</p> <p>pricing 207:3</p> <p>primarily 22:16,20 63:12 220:11</p> <p>primary 32:13 54:10 149:7</p> <p>prime 178:7</p> <p>primes 138:10,11</p> <p>principal 3:17</p> <p>principle 172:4 186:2</p> <p>principles 16:12 83:2 118:22 120:3,5</p> <p>prior 19:5 94:11 101:16 143:1,8,10,17 144:2,3</p> <p>priorities 116:23</p> <p>private 202:1</p> <p>privilege 2:14</p>	<p>privileged 2:11,14 6:19</p> <p>prize 125:9 195:10,16,23 196:20 197:12,20 198:3,4,11,20 202:11,12,17,24 203:4,22 206:2,6</p> <p>prizes 195:13 197:4,13,18 201:4,5 202:21</p> <p>probability 111:6</p> <p>probably 20:18 32:9 46:19,20 54:2 58:5 71:17 77:1 80:8 86:23,24 87:24 89:4,7 90:4 93:20 95:12 100:12 107:21 108:21 132:23 133:18 135:11 145:12 168:2 173:6,20 183:2,13 187:11 200:13 202:18 221:24</p> <p>problem 40:17 53:20 57:17 61:21,24 74:24 75:1 79:2,15,22 92:11 101:10,14,23 104:8 116:12 121:19 122:1 147:16 179:23,24 180:1,3 187:19,20 203:18 205:4 212:6</p> <p>problematic 161:9 187:17</p> <p>problems 88:15 116:21 121:10 122:2 154:2</p> <p>procedures 131:9</p> <p>process 2:17 13:9 15:24 41:18 44:9,17 47:1</p>
---	---	---	--

79:18 90:14 102:10 113:7 116:14 132:20 137:16 138:2 142:17 155:11 164:16,20 166:6 185:21 186:3 192:13 196:18 212:10 220:17,18,21,23 221:22 222:9	14:14 15:19 131:6 159:10 professor 10:12 proficiency 161:16 program 1:8 3:7,15,20 4:8 8:9,11,13 9:15 25:9 30:1,17 35:19 114:17 152:20 211:14 225:10 programmed 30:8 programming 38:7 165:13 programs 4:15 43:5 47:23 80:14 108:3 120:17 168:2 211:21 progress 39:10 110:24 111:1 115:20 178:18 progressed 93:13 project 9:18,20 12:4 22:24 37:13 53:7 143:18 projection 109:10 projects 73:23 promise 120:6 promote 8:21 promotes 217:22 promotion 218:7 prompt 31:11 33:5,6 37:21 38:10 82:24 83:10,12,13,15,1 8 91:11 105:1 110:22 144:15 173:1,12,16,17 178:11,12 214:12,24 prompt-based 215:1 prompting 144:13 prompts 31:13 84:2,17 104:23,24 140:12 146:2,8,10	148:13,14 150:17 178:11 214:11,18 prong 38:8 proof 203:7 proofs 198:10 proportion 108:5 213:18 propose 124:4 proprietary 204:20 propriety 213:10 prose 28:5 protocols 123:16 158:20 220:21 provide 2:22 6:14 7:7,22 13:21 14:20 15:17 21:20 23:11 27:14,17,23 35:1,22 41:14 53:16 58:7 64:20 65:3,10 114:9 117:17 126:9 132:5 137:8 148:11 149:8 164:3 170:21 191:7 197:7 210:20 provided 164:9 177:1 providers 222:6 provides 64:21 65:9 70:9 142:1,3,4 160:23 providing 12:18 14:12,14,18 17:18 24:1 159:9,11 222:18,22 proxies 119:6 pry 134:1 PSA 194:1 psychology 40:7 psychometrician 177:10 psychometricians	182:20 psychometrics 168:2 182:23 183:15 public 1:8,9 2:12,19 3:2,3 6:3,17 7:3,5,23 8:15,16 74:8 113:24 124:22 126:17 153:14 161:19 165:17 186:14 210:5 219:21 223:23 224:15,24 225:8 publication 49:8 219:23 publish 48:3 published 121:4 129:16 202:23 publishers 222:4 pull 55:19 174:15 208:11 Punic 30:10 purchase 103:20 126:23 PURE 216:6 purpose 2:21 4:13 7:5 8:20 64:12 67:24 118:19 193:6 197:6 198:5 199:3,6 210:6 purposes 2:16 62:14 64:11 119:22 151:6,7 202:13 purse 103:5,6 push 41:7 75:4 104:12,15 105:17 179:7 195:3 198:20 208:11 pushed 179:5 pushes 85:3 pushier 131:4 pushing 181:16 puts 180:4 195:22
--	--	---	---

<p>putting 121:15 127:17 162:22 182:11</p> <hr/> <p style="text-align: center;">Q</p> <hr/> <p>qualifications 118:16</p> <p>qualities 181:18</p> <p>quality 56:23 61:20 68:9,10 85:15 100:18 111:10,14 112:23 119:20 120:3 123:2 136:16 138:1 139:11,12 140:1,3 157:1,4 164:4 179:21</p> <p>quarter 95:11</p> <p>quarterly 218:10 221:10,22</p> <p>Queen 29:7 132:10</p> <p>question 30:9 38:23 40:15 49:21 51:4,14,22 71:16,17 72:12 81:9,19 83:24 86:9,10,15 91:15 98:24 99:5 100:16 102:2 105:3 109:4,12 113:3,14 114:21 115:8 120:13 122:12 123:15 124:14 135:6,14 142:22 148:13 162:1,8,18 163:22 164:1,5 165:3 168:19 177:16 182:22 183:4,17 187:10 190:3 191:5 201:16 203:18 204:13 207:10 209:3 212:5</p> <p>questions 5:19 6:1,14,15,23 7:7 8:1,8 19:14 26:3 36:7 41:4,8 43:20,21 50:13 52:4 56:16 57:24 59:24 60:3 70:17</p>	<p>71:12,14 75:14 82:9 89:19 93:15 96:16,19,24 115:14,23 116:16 123:12 126:7 142:20 150:23 170:4 174:4,18 180:10 181:3,6,7,15 183:22 184:3 185:16,17 186:9 192:22 197:8 199:16,18,24 200:24 201:11 202:7 204:3 206:11 209:2,9,23 210:10 217:7,8,10,11 219:3 223:13</p> <p>quick 5:10,20 6:8 8:20 24:11 74:3 111:1 112:10 125:2,6 127:7 130:19 186:15</p> <p>quickly 2:10 8:10 23:4 25:1 38:7 62:17 113:15 182:14 187:6 195:19 197:1 208:24 215:20</p> <p>quirky 132:16</p> <p>quite 45:13 54:16 67:16 75:24 85:9,12 86:8 87:1 110:6 112:23 179:1 184:14 196:12</p> <p>quote 43:3</p> <hr/> <p style="text-align: center;">R</p> <hr/> <p>Race 1:7 3:6 4:7 8:9 116:5 225:9</p> <p>races 66:3</p> <p>racetothetop.asses sment@ed.gov 8:3 114:10 210:22 225:11</p> <p>radically 97:7 103:17</p> <p>radius 69:20,22</p>	<p>Rahm 222:21</p> <p>raise 26:4 41:24</p> <p>raised 154:13,21 155:16 217:7</p> <p>raising 218:24</p> <p>ran 8:10 131:2 167:11</p> <p>random 48:6 58:11</p> <p>randomly 33:19 103:13</p> <p>range 4:3,23 5:17 8:22 47:15 58:18 82:17 116:7,18 118:18 155:20 161:9</p> <p>rap 181:22</p> <p>rapid 55:20 61:4</p> <p>rapidly 71:6 101:1</p> <p>rare 34:11 47:20 66:14,21 67:11,13</p> <p>rate 60:20 76:12 110:3,7 139:5</p> <p>rated 34:10</p> <p>rater 30:5 47:17,20,21 50:21 78:17 79:10 101:18,21 140:5 180:2,3</p> <p>rater-behavior 28:10</p> <p>raters 31:20 33:24 34:13 48:1 53:7 55:8 78:24 79:3 101:22 113:16 129:20 131:22 140:8 145:2,5 160:22 179:19,20,24 180:11</p> <p>rates 47:14 48:11,15 51:5,6 57:5 132:13</p> <p>rather 95:23 121:1 131:24 141:8 147:20 178:3 221:11</p>	<p>rating 34:10 55:17 56:2 60:23 130:15</p> <p>ratings 33:24 34:12 56:3 129:2 130:8 131:22,23</p> <p>rational 31:20</p> <p>reach 25:6 33:11</p> <p>reached 206:23</p> <p>reaching 52:2</p> <p>reaction 128:1</p> <p>readability 137:6 140:20 143:20</p> <p>read-behind 161:1,6</p> <p>reader 91:6 143:17,19 144:3 159:7 160:20</p> <p>readers 112:6 144:3</p> <p>readiness 3:19 4:9 15:5 20:23 21:2,12 22:2 185:12</p> <p>reading 4:1 31:22 76:2 83:18 112:6 117:14 136:12 148:3,4 211:13 220:5</p> <p>ready 12:24 14:7 15:13 19:7 110:23 139:19 162:21 179:1 211:2</p> <p>Reagan 30:4</p> <p>real 58:19 86:23 97:21 98:11 132:21 138:23 157:17 165:9 185:9</p> <p>realistic 37:13 194:2</p> <p>realistically 86:5</p> <p>realize 8:10</p> <p>realized 18:22</p> <p>really 2:16,24 3:21 6:21 7:6 8:21</p>
--	--	--	--

<p>12:6 14:3,15 15:15 16:19 17:12 18:23 26:14,22 35:9,10 36:15,20 37:7 40:8 41:6 44:1,3,17 45:1 48:4,14,24 50:22 58:14 60:14 72:7 73:20 75:11 78:19 80:23 82:20,22 92:10,20,21 93:9,24 94:3 98:21 100:9 107:1 109:11,12,21 111:1 112:8 113:11 116:4,14 123:12 129:9,10,17 130:10 131:5 132:3,8 133:15,17 134:2,6,9 135:20,24 143:20 145:21 150:20 152:2,20 153:12,22 154:8 155:7 156:10,22 157:5 158:15 159:14 160:15,20 161:15 162:15,17 164:15 165:10 167:15 168:15 169:3,14 173:6,12,13,15 175:12,19,24 176:18 177:1,3,7 180:1 181:23,24 182:1,9 184:12,20,24 185:7,12,14 186:5 187:8 188:1,5 189:18 192:15 193:17,20 195:23 196:3,5,7,12 197:6 199:8,11 201:5 207:18 208:3 215:18</p>	<p>217:3 220:1,8 222:13 223:6,11,16 224:3,6</p> <p>real-world 124:4,16 140:5</p> <p>reason 46:14 58:6 111:9 121:11 137:18 138:19 146:3 147:11 183:23 188:19 199:8</p> <p>reasonable 37:19 82:16</p> <p>reasonably 77:6 83:22 207:18</p> <p>reasoning 46:8</p> <p>reasons 64:10 135:16 143:9,21 176:19 212:12,14</p> <p>reassured 116:19</p> <p>re-calibrate 214:20</p> <p>recall 121:2</p> <p>receive 136:14,16 137:1</p> <p>receives 190:24</p> <p>recent 216:15</p> <p>recently 26:12 121:22 169:19 216:7 219:23</p> <p>Recess 74:16 127:4</p> <p>recognition 27:8 35:23 39:15,21 43:9 45:11 75:20 76:7,12,20,23 77:10</p> <p>recognizable 160:17</p> <p>recognize 30:6 43:10 50:3 54:15,17 198:15</p> <p>recognized 30:16 201:6</p> <p>recognizes 54:20</p>	<p>recognizing 144:2</p> <p>recommendation 121:4</p> <p>recommendations 120:16,22 121:16</p> <p>recommended 187:24</p> <p>record 118:11 123:22,23 226:7</p> <p>recording 154:19</p> <p>recover 162:9,13</p> <p>recovery 110:3,7</p> <p>recurring 105:14</p> <p>red 20:1 46:18 114:4,5 196:23 210:17</p> <p>redid 129:21</p> <p>redo 110:21</p> <p>redone 128:15</p> <p>reduce 96:9 122:6,19</p> <p>reduced 18:16 222:19 226:6</p> <p>reduces 96:11</p> <p>refer 37:10 218:9</p> <p>referred 88:22 175:21 214:8</p> <p>referring 214:10,21</p> <p>reflect 3:11 6:15</p> <p>reflecting 186:12</p> <p>reflection 187:3</p> <p>regard 27:2,11 32:24 34:15 35:15 55:6</p> <p>regarding 119:5</p> <p>regards 78:6</p> <p>regional 122:1</p> <p>registered 124:24</p> <p>registration 7:12 118:5</p> <p>regress 33:23</p> <p>regression 55:22</p>	<p>60:19,24 129:18</p> <p>regression-based 55:4,24 60:16 107:19 128:23 131:14 132:2,17 133:10 134:3</p> <p>regressions 129:13</p> <p>regular 218:10</p> <p>reinvent 193:7</p> <p>rejected 39:8,9</p> <p>relate 43:11</p> <p>related 14:18 15:7 20:14 25:2 180:15 226:8</p> <p>relates 11:17 18:7 222:1</p> <p>relation 117:9 143:17</p> <p>relationship 70:24 124:15 145:3,4</p> <p>relationships 71:2,7</p> <p>relative 49:12 70:19 95:22 116:10 134:12 154:16 226:11</p> <p>relatively 22:8 24:11 165:22 169:17 195:19 197:2</p> <p>release 84:16 118:5</p> <p>relevance 52:17 139:9</p> <p>relevant 56:7 66:8 119:8</p> <p>reliabilities 51:13</p> <p>reliability 30:18 48:11 50:21,22 51:1,5,11,20,24 59:8,16 102:3,15 109:23 112:14 113:12,13 140:9 150:18 157:1 164:14 179:18,22 184:6</p> <p>reliable 4:3 5:7 51:8 70:20</p>
--	--	--	--

<p>117:17 129:19 130:13,19 139:1,6 188:10,12,23 192:17 221:1</p> <p>reliably 100:13 101:3 182:13 188:3</p> <p>reliance 24:18 217:21</p> <p>relies 72:17</p> <p>relieved 116:1</p> <p>rely 72:2</p> <p>relying 161:20</p> <p>remain 119:22</p> <p>remaining 34:2</p> <p>remediating 212:20</p> <p>remember 51:3 187:10</p> <p>remind 124:20</p> <p>reminded 152:2</p> <p>reminder 3:6 8:20 19:21 114:2 115:12 224:13,22</p> <p>reminders 8:5</p> <p>remove 137:17</p> <p>repeat 102:10 210:5</p> <p>replace 107:22 176:19,20</p> <p>replacing 179:12</p> <p>replication 182:23,24</p> <p>report 4:20 120:20,22 183:11</p> <p>REPORTER 226:1,21</p> <p>reporting 13:6 23:15 62:4,7</p> <p>reports 91:4,6 109:17 221:19</p> <p>represent 4:11</p> <p>representation</p>	<p>34:9</p> <p>representative 20:16 170:19</p> <p>representatives 12:2</p> <p>representing 10:2,5,10,14,16 215:14</p> <p>request 164:17 172:18</p> <p>require 56:1 59:11 92:23 98:21 132:14 133:12</p> <p>required 39:17 46:16 88:16 90:18 130:23 154:17 156:6</p> <p>requirement 15:23</p> <p>requirements 4:15 8:11 118:7 171:13 191:5</p> <p>requires 182:22,24 185:22 199:21</p> <p>research 22:23 25:20 32:11 39:13 49:7,16 53:7 76:16 81:5 107:21 109:17 118:1 119:13 120:19 130:3 146:12,19 148:2 162:11,15 176:11 178:21 179:9 182:18 218:17 220:24</p> <p>researchers 167:19,21 168:1</p> <p>resolve 157:19</p> <p>resource 61:15</p> <p>resources 106:13 193:6 206:16</p> <p>respect 37:16 162:5 163:12</p> <p>respects 56:12</p> <p>respond 43:15 64:13 82:8 86:9 138:3 171:24 190:2 209:5</p>	<p>210:9</p> <p>responding 115:13 212:9,12,15</p> <p>responds 138:13</p> <p>response 16:6,8 17:4,8 22:13,17,20 23:1 27:6 39:3 40:15 43:18 44:14 45:19,20 46:18 51:9 86:17 90:2,5 109:3 111:22 117:18 153:24 154:7 155:19 157:13,14,15 161:8,14 171:23 173:11 185:17 186:1 187:17 188:3,15 189:15</p> <p>responses 18:14 29:21 31:18 41:4 43:6 44:12,21 45:8,21 47:24 52:15 117:24 153:7 156:17 157:23 158:17 160:10,14,18 161:8,18 172:2</p> <p>responses/scoring 50:6</p> <p>Responsible 215:11</p> <p>restate 144:15 204:12</p> <p>result 18:14 30:10 33:7 55:2 117:6 147:5 185:1,2</p> <p>results 4:21 5:8 18:13 23:3 49:14 53:9 55:6 77:15 102:7 109:18 115:2 132:5 157:8 169:14 186:14 189:8 212:19 216:12 217:16</p> <p>re-test 113:12</p> <p>retired 219:20</p> <p>return 24:11 43:17</p>	<p>158:13</p> <p>returning 61:4</p> <p>returns 156:4</p> <p>reuse 105:1</p> <p>reused 57:11</p> <p>revealed 119:14</p> <p>review 13:5 154:5 170:20</p> <p>revisions 148:24</p> <p>revolutionize 42:20</p> <p>reward 78:18 79:2 197:23 198:1 201:15,19 202:19</p> <p>rewarding 203:2</p> <p>rewards 202:5</p> <p>rhetorical 149:17 173:14 212:5</p> <p>rich 223:6</p> <p>rid 96:18</p> <p>Rights 216:9</p> <p>ring 52:1</p> <p>rise 116:5</p> <p>risen 75:8</p> <p>rising 114:24</p> <p>risk 135:10 202:16</p> <p>road 91:14</p> <p>roadblock 92:1</p> <p>robust 117:4</p> <p>role 11:22 173:9,11</p> <p>roles 115:14</p> <p>Rome 30:11,15</p> <p>Ronald 30:4</p> <p>room 1:16 54:4 74:5 191:24 202:11</p> <p>Rooney 9:6,8 11:7 19:16 20:4 25:11 36:2 38:22 40:9 41:1 50:10 52:3 59:22 62:18 71:10 72:11</p>
---	--	--	--

74:1,17 81:8,18 82:6 87:10 95:14 98:23 100:15 101:6,24 111:21 113:22 115:11 117:8 120:8 123:8 124:19 126:13 127:5 135:4 136:2 142:18 144:5 150:22 152:7 159:24 161:22 167:3 169:24 171:4 172:9 178:19 186:9 190:23 192:21 194:23 210:1 212:24 215:4 219:17 223:2	208:23 rural 207:20 Russians 75:24	211:5 school 3:16,24 4:2 14:6 15:12 18:1 19:1 21:23 22:8 91:19 118:12 123:19 146:14,16 149:22 150:8 184:15 200:21 207:17,22 216:2,16	161:15,20 162:17 164:13 172:3 174:24 179:20 180:9 182:13 183:5,6,8,9,11,1 2 184:8,20 186:23 188:6 191:13,16 214:11,19 216:5
roses 46:18 rough 60:12 roughly 16:14 round 223:4 route 89:1 routing 88:22,23 rubric 32:2,18 78:20,23 79:8 139:24 140:14 159:12 171:2 rubrics 31:22 32:11,20 86:4 177:4 rule 90:19 187:15 rule-based 128:17 129:22 130:22 132:18 133:12,22 135:16 rules 90:20 128:18 134:2,16 135:20 ruling 198:4 run 14:23 55:13 103:14 104:4 107:11 135:10 159:16 160:8 164:21 168:12 176:5 running 58:4 86:1 140:24 159:21	<hr/> S <hr/> sacrificing 172:8 safe 225:13 sailed 29:7 salad 29:13 salaries 216:22 sample 33:18 122:11 155:1 samples 94:8 188:5,6 sandwiched 14:3 Santa 29:7 satisfactorily 100:23 satisfied 177:1 save 48:22 savings 18:17 95:13 97:22 98:9,11,12 saw 49:14 131:13 SBAC 4:10 20:20 scaffold 187:4 221:21 scaffolding 45:6 115:4 187:4 192:6,16 scale 34:10 49:5 58:15,16 60:23 125:13 147:8 152:17 155:1 Scalise 80:1 Scalise's 45:1 scan 77:2 scenario 16:23 54:2 104:18 scenarios 106:11,14 schedule 74:5 scheduled 2:5 224:24 Schlitt 210:23	schools 21:22 42:18,21 91:17 120:17 123:18 146:4 216:22 218:23 219:21 science 34:4 64:13 109:3 111:6 120:13,24 121:1,21 122:16 125:23 167:12 Sciences 10:24 120:19 scientific 44:22 98:20 99:16 111:8,13,16 120:2 scorability 31:16 scorable 171:19 172:6 192:8 score 4:20 16:11 27:22 28:22,23 29:16,19 31:4 36:13,14,16,17 37:22 45:24 51:17 53:8 58:18 59:16 61:1 72:18 79:13 86:16,19 90:15 91:10 95:17,19 100:3,18 105:6 111:4,11 119:4,5 128:19 132:15 133:2 138:8 139:6 144:19 147:6,7 148:12 153:11 154:6 156:5,17,18 157:10 158:1,13,14 159:8,12,18 160:11,16,17,18	scored 18:14 27:9 31:19 39:3,9 44:11 45:9 46:2 55:11 61:13,17 84:11 89:18 91:12,13 100:13 102:9,12 134:12 183:1 scorers 96:18 102:5 112:7 173:2 scores 5:7 15:2 36:12 48:12 55:20 58:1 61:4,5,8,9,10,11, 20 88:18 102:4 119:8,10,16 130:18 134:22 147:13 148:3 152:22 153:7 154:19 156:4 157:19 158:13 160:10 161:10 164:4,14 177:11,14,24 178:1,6 188:3 216:4,21 218:18 scoring 5:3,5,16 6:12,22 7:10 11:19 15:7 17:8,12 18:18 23:5,6,15 24:10,15,16 25:14,16,19,20,2 2 27:2,7,10,11 30:18 31:23 34:21 37:14 38:19 39:2,16 41:13 43:4,13,16,17,24 44:8,9 45:18 46:9,10,11,12,13 ,14,15,20,23

<p>47:1,8,10,16,17 48:18 49:2,5 50:21,23 51:1,2,7,12,19 52:14,21 53:1,6,8,13 55:3,4,14 60:8 62:4,7,13 74:21 75:9,11 78:22 79:6,17 80:11 81:15,16,21,24 82:5,17 84:7,12,18 85:20 86:11,19,21 89:10,12,22,24 90:8 91:21 92:1 94:24 95:9,23 96:20 98:1,17 99:3 100:2,6 102:7,12,16 105:8,20 106:1,8 107:19,23 108:21 109:13 110:19,21,22 111:7 112:1,4,5,9,10,1 4,20,23 113:6,9,12,16,20 114:21 117:16,17,20,22 118:2,8,19,23 119:2,14,21 120:6 121:17 125:10,11 127:17,18 128:10,13,17 129:4 130:5,22 132:20,22 133:9 134:10,19 135:19 144:21 145:9,17 147:22 152:16 153:11,12,16 154:4,9,15,16,19 ,21,22,23,24 155:6,7,8,10,14, 18,22 156:13,14,17,19 157:2,3,16 158:4,6,7,9,23 159:2,5,7,13,20 160:5,9,12,13,15 ,19,21,23 161:1,2,4,6,18</p>	<p>163:9 164:3 165:4,16,24 167:7,23 169:8,12 170:2,10,12,18,2 1 171:1,2,7,12,20 172:7,11 173:3,11 174:10,13,14 175:4 177:18,20 179:18 186:7,16 187:14,17,18 190:5,8 191:6,21 192:10 204:1,18 207:12 210:8 212:17 215:1,16</p> <p>scratch 72:21</p> <p>screen 33:14 39:24 92:13</p> <p>screening 94:11</p> <p>script 117:14</p> <p>seamless 156:9 166:24</p> <p>second 2:3,24 4:19 7:16 34:5 44:6 57:2 86:15 91:5,11 122:10 156:20 160:19,20 164:1 200:12 211:2</p> <p>secondarily 85:23</p> <p>Secondary 9:23</p> <p>second-language 66:6,18 67:7,17</p> <p>secondly 199:19 206:9 219:6</p> <p>seconds 48:17 123:5,6</p> <p>secret 135:1 147:1</p> <p>section 88:19 115:22</p> <p>sections 88:19,20 97:20</p> <p>sector 165:18 203:1 205:19,22</p> <p>sectors 201:9</p> <p>secure 24:2</p>	<p>security 57:10,12,16 62:14 84:21 147:2</p> <p>seeing 159:17 203:3</p> <p>seek 9:2</p> <p>seem 77:21 120:1 130:18 134:7 148:1 149:13 218:19</p> <p>seems 105:24 116:3,13 163:11,19 165:3,5 172:10,15 179:2 209:2</p> <p>seen 15:14 36:11,17 37:17 47:14 77:18 89:8</p> <p>sees 39:24</p> <p>select 33:19</p> <p>selection 18:16</p> <p>selections 6:4</p> <p>self-explain 136:13</p> <p>self-explanation 136:15,17,18 138:4</p> <p>self-limit 117:13</p> <p>semantic 63:3,14 67:19,20,22 68:1,6,8 70:24 71:7,20,23 73:18,19</p> <p>semantics 64:2</p> <p>semester 146:15,16</p> <p>send 156:18 157:23 161:11,18 197:10 200:2</p> <p>sends 156:3</p> <p>sense 13:14 25:22 40:19 53:19,24 78:17 79:1 100:19 112:11 121:10</p>	<p>134:8,13,24 147:20,21 159:10 161:3,12 169:5 171:3,6</p> <p>senses 67:12</p> <p>sensible 172:16</p> <p>sensitive 70:23 184:13 199:15</p> <p>sensitivity 200:3,14</p> <p>sent 61:16</p> <p>sentence 32:12,16 39:8 65:12 69:15 70:5 84:13 138:8 140:2</p> <p>sentences 39:7 68:3 69:12</p> <p>separate 14:17 53:4 73:21 88:18 157:23 170:10 193:7</p> <p>separately 213:22</p> <p>series 2:3,12 79:16 88:5 120:15 224:24</p> <p>serious 107:12</p> <p>seriously 62:15</p> <p>serve 25:8</p> <p>servers 96:15,16,20,23</p> <p>service 76:1 217:6</p> <p>session 18:15 21:17 77:15 113:23 124:21 144:14 166:18</p> <p>sets 68:1,2 69:2 120:15 122:3 147:19 168:7 190:20</p> <p>setting 199:7</p> <p>settings 89:13</p> <p>settle 29:10</p> <p>several 30:1 55:11 61:11 104:12 109:9 114:1 120:16 140:19 177:21 178:11</p>
---	---	---	---

<p>severe 218:24</p> <p>shape 154:8</p> <p>share 4:23 22:4 81:11 97:20 201:8 203:16 205:2</p> <p>shared 169:23</p> <p>Sharnell 210:24 219:18,19</p> <p>sheet 201:11 209:11</p> <p>Sheinker 9:17 39:1 40:24 208:18</p> <p>Shelbi 10:1 162:3,4</p> <p>Shermus 10:11 25:13 26:5 36:19 37:20 38:14,18 39:12 76:18 77:24 78:3,13 82:13 91:1 92:6 97:14 99:10 102:17 108:2 109:11 144:9 151:11 165:19 172:21 174:22 178:2 188:8 207:9</p> <p>ship 77:3,4</p> <p>ships 29:7</p> <p>shooting 151:23</p> <p>shop 96:6 97:11</p> <p>short 5:13 27:6,18 39:2 44:13 45:8,20 47:3 52:15 84:12 100:11 117:23 126:18,24 137:24 155:19 157:13 176:5 195:20</p> <p>short-answer 100:3,5 106:4 189:15</p> <p>shorter 29:21 187:14</p> <p>shortly 100:14</p>	<p>shot 82:14 104:13</p> <p>shots 33:14</p> <p>showed 49:11</p> <p>showing 45:2 58:1</p> <p>shown 119:24</p> <p>shows 101:8 138:24</p> <p>shrinkage 34:4</p> <p>sides 50:8 164:4</p> <p>sign 6:6 7:11,13 74:10,12 114:1 124:23 210:19</p> <p>signed 19:4 210:4</p> <p>significant 39:6 145:10</p> <p>significantly 212:7</p> <p>similar 12:7 66:19 69:17 83:3 109:17 119:12 137:24 166:22 171:13 214:18 216:14</p> <p>similarly 183:21 198:8 201:19 218:9</p> <p>simple 43:16 50:16 59:2 182:21</p> <p>simplifications 43:22</p> <p>simplify 204:14</p> <p>simply 14:11 16:17,23 39:24 58:14 60:16,23 68:16 73:8 87:14 116:17 123:22 128:24 153:15 154:7 159:20 160:16,18 165:21 189:9</p> <p>simulated 53:5,19 54:9,23</p> <p>simulation 53:4,17,23,24 58:8,20,24 59:14 168:21 169:2,3 183:22 184:5</p> <p>simulation-based</p>	<p>117:22 118:3</p> <p>simulations 53:2,16,22 55:3 56:15,19 58:2,10 59:15,20 94:20 128:11 174:11 184:2</p> <p>Singapore 122:15,16,18,20</p> <p>single 17:2 27:22 49:11 106:20 129:6 154:1 157:18 158:1</p> <p>single-sitting 16:3</p> <p>singular 67:23</p> <p>sit 59:12 216:17</p> <p>sits 114:18 156:2</p> <p>sitting 16:18 42:4 102:23 127:9</p> <p>sittings 17:2</p> <p>situation 69:11 82:19 89:9 94:9 151:17 160:6,16 161:14 178:2 208:2 211:20 212:3</p> <p>situation-model 181:1</p> <p>situations 46:15 110:9 153:15 216:14</p> <p>six 41:3 58:4 71:21 89:17 116:24 209:14</p> <p>sixth-grade 109:2</p> <p>size 49:14 70:21 203:19</p> <p>sizes 219:1</p> <p>skepticism 217:4</p> <p>skill 147:19 182:7</p> <p>skills 38:7 39:17 40:3 112:8 149:17 173:14 175:2 188:20 199:3</p> <p>skip 160:2</p> <p>skipped 162:19</p>	<p>slide 12:22 34:23 37:23 42:5 48:22 131:13 152:12,19 155:6 162:19</p> <p>slides 8:18 15:14 26:8 30:13 33:1,3,16 42:4 47:8 148:6 159:22</p> <p>slightly 40:16 109:19 167:13</p> <p>slippery 29:5</p> <p>slots 87:20</p> <p>slow 212:10</p> <p>small 103:20 169:17 192:5 196:2 197:2 205:22 213:17</p> <p>smaller 45:3 73:16</p> <p>small-time 96:6</p> <p>smart 125:10 132:14 168:16</p> <p>smarter 4:10 10:2,16,18 11:5,14,16,23 12:1 17:12 18:21 41:4 75:5,7 123:1 127:15 144:23 155:17 165:11 191:17</p> <p>smartphone 92:9</p> <p>smartphones 92:15</p> <p>smoothly 164:21</p> <p>snap 154:7</p> <p>social 34:3 47:1,18 197:16 221:7</p> <p>software 27:12 57:7 158:20,21 159:1 167:22 168:5,12</p> <p>solution 9:1 79:19 85:20 174:21 201:10 204:8 209:4 222:14</p> <p>solutions 86:7 140:11</p>
--	---	--	---

solve 80:6 88:14 122:1	sounded 72:14	64:4 201:16 221:3	89:6
solved 121:18	sounds 69:23 72:19 75:9 80:4 128:17 176:17 208:14	specifications 13:5	stages 20:14
solving 121:11	source 119:16 165:12,16 167:21,24 168:6	specificity 127:15	stakes 152:21,22 153:4,12 179:1,2,7 217:14 221:16
somebody 36:23 37:4 54:14 60:21 62:15 66:1 96:23 104:4 122:7 188:18 199:2	sources 63:24 123:3 158:6,10	specifics 66:8	stampede 74:11
someday 37:9	sourcing 196:8	specs 162:21	stamps 47:24
somehow 153:16 157:23 176:1	space 68:7,8,11 70:3,7,8,19,20 72:17 73:9,19 201:18 202:4 209:6 213:22 214:1	speech 27:8 66:24	stand-alone 59:16
someone 26:15 51:15 61:5 90:12 114:8 124:3,7 143:1 202:19 203:6,21	spaces 73:16,18 86:7	speeches 115:23	standard 35:19 48:19,20 166:18 200:7,18,19 208:6
somewhat 66:8 70:21 81:14 163:11 213:13	Spanish 149:8,9	speed 47:6 206:13 207:6,7	standardized 166:10 216:13,16,18,20 217:20,21 218:14
son 150:8	spark 196:3	spell 154:11	standards 4:4 12:23 13:24 14:4 15:10 18:3,5 25:4 97:19 98:6 117:20 120:7,24 121:8,9 123:16 137:7 147:22 155:23 174:23,24 188:9 189:10,21 217:24
sonnets 37:8	sparse 68:20	spelling 78:7	standards-based 218:10
sophisticated 21:7 44:15 66:14,15 116:6,23 211:21	speak 7:12,14,15 52:7 64:16 70:11 75:18 84:23 171:11 215:18	spend 5:12 11:19 36:4 52:20 96:4 97:24 108:18,19 182:2 187:21 188:4	standing 78:4
sophistication 99:18 102:18	speaker 64:14 208:22	spending 98:9 106:12 108:7,20 148:24	standpoint 40:7
sorry 40:13 72:8 83:13 100:15 102:1 133:21 205:7 215:6	speakers 118:15	spent 63:2 91:20 97:6 106:21 197:17	Stanford 95:6
sort 15:15 16:7 31:19 51:6 56:24 60:12 81:19 82:23 88:4,23 99:11,21 100:11 103:11 105:11,12 107:14 125:9,24 126:10,11 130:16 146:6,17 149:1 158:18 161:3 165:14 178:9 182:23 186:14 189:19 195:16 207:13	speaking 167:20	sphere 52:10,11	Star 42:14,17
sorts 129:9 137:2	speaks 111:18	spheres 69:20,22	start 9:10,11 11:12 30:14 36:9 42:6 45:5 48:14 50:18 51:13 60:5 72:21 75:14,23 86:13 88:21 99:21 113:4,18 116:11,14 127:1 146:3 147:6 157:7 162:21 174:17 187:5 192:5 201:14 212:20 215:8
sound 112:22	special 39:4 49:4 145:22	spices 29:10	started 112:2,3
	specialize 65:14 143:7	spiral 104:23	
	specialized 165:6	spirit 195:8	
	special-needs 145:19	split 195:17	
	specific 9:1 11:22 17:11 18:3 67:9 84:7 107:8 139:24 140:1 143:14 154:12 204:9 208:9 214:23 223:20	spoken 66:24 117:24	
	specifically 11:18 15:6 16:15 44:7	sponsored 120:18	
		spreadsheet 88:13,14	
		SPST 81:11,13	
		square 139:17	
		squeeze 189:11	
		stabilize 160:21	
		stable 49:14	
		stack 126:5	
		staff 107:24	
		stage 86:24 87:19 117:5 201:1	
		staged 87:3,11	

<p>127:3,6 143:18 196:17</p> <p>starting 23:19 44:16 47:23 49:4 222:20 224:17</p> <p>starts 46:18</p> <p>state 3:23 9:20 10:5,9,15,17 12:3,23 14:4 18:5 32:20 75:19 81:11 98:2,9 108:3 121:15 122:11 144:19 149:5 178:12 190:22,24 205:14 207:11,21 211:13 216:4 220:5 222:20 226:22</p> <p>state-by-state 217:13</p> <p>state-led 13:11</p> <p>statement 144:15 220:2</p> <p>statements 128:19 137:17</p> <p>state-of-art 5:24</p> <p>state-of-the-art 5:2 6:12,22 9:3 174:2,5,6,9</p> <p>states 3:7 4:11 12:8,9,10 13:15,17 15:7 17:23 19:3 20:9,12,16,17,19 ,21 21:5,9,24 32:19 39:17 43:1 49:6,17 52:21 78:22 79:2 91:1,16 97:21 112:24 118:6 150:13 163:2,5 172:13 177:19 178:10,13 192:2 194:14 195:1 199:10 200:14,20 205:5,9,10,13 207:15 208:3 209:3 216:13</p>	<p>219:6 222:8</p> <p>statewide 189:8 191:1</p> <p>state-wide 91:9</p> <p>station 103:10,13</p> <p>statistical 28:15 44:4 48:16 63:24 64:3 67:23 70:6</p> <p>statistically 43:14 47:21</p> <p>steam 114:24</p> <p>Stegman 10:8 23:9 50:20 51:15 94:19 177:15</p> <p>stem 120:18</p> <p>stenotype 226:6</p> <p>step 13:4 43:9 61:21 80:10 172:16 194:7,10,20 195:9</p> <p>steps 43:7 56:23 73:15 80:8 175:17</p> <p>step-wise 139:3</p> <p>Stern 114:11,14,15</p> <p>stick 73:11</p> <p>stimulates 31:16</p> <p>stoke 125:17</p> <p>stole 101:7</p> <p>stolen 103:2</p> <p>stone 168:23</p> <p>stood 167:15</p> <p>stop 114:6 123:5 138:2 159:23 180:1 203:12</p> <p>storage 199:21</p> <p>storing 34:16</p> <p>story 29:14 102:22</p> <p>straight 16:18</p> <p>straightforward 106:18</p> <p>strange 132:6</p> <p>strategic 166:11</p>	<p>strategies 40:19,22 44:16 45:11,16 63:17 81:1,3 136:14,22,24 137:2 140:1 141:21</p> <p>strategy 40:18 63:12 136:11,21 138:17 208:11,12</p> <p>straw 47:3</p> <p>strength 157:17</p> <p>strengths 154:24 156:10 170:9,12 221:20</p> <p>strict 147:20</p> <p>strikes 170:3 178:23</p> <p>stringent 171:15</p> <p>strong 12:12 13:1 34:8 41:11</p> <p>strongest 197:22</p> <p>struck 106:11 170:7</p> <p>structure 15:6,15 29:18 42:21 139:9 212:18</p> <p>structures 12:1</p> <p>struggle 186:18</p> <p>struggling 49:24 185:6</p> <p>student 3:18 13:2 21:7,21 33:8,11 39:23 45:7 46:2,17 50:6 79:15 80:9 81:12 82:4,17 86:18 87:18 90:18,22 99:3,23 101:15 106:23 115:6 124:12 139:7 140:6,15 149:4 150:12 151:12 161:16,21 171:23 186:21 188:7 211:22 212:3 218:18 221:2</p> <p>students 2:7</p>	<p>3:10,12,13 4:6 12:24 14:6 15:12 16:16,17,21 17:6 20:24 21:2,11 24:2,5 32:15 39:4,5,14 42:18 76:10 80:3,5,19 85:2 86:17 93:12,17 104:19,21 106:22 107:9 121:21,23 135:10 136:13 140:8 141:22 147:23 148:21 155:14 159:8 168:2,8 171:21 178:1 182:8,11,15 185:8,14 187:22 193:20 211:18 212:7,8,11,14,21 220:4,14 221:8 222:18,19,23 225:2</p> <p>student's 161:16</p> <p>Students 49:15</p> <p>studies 30:1 31:5,7,17 49:13 65:17 70:17 108:8 109:23 129:16 138:5 179:9 188:23</p> <p>stuff 77:14 97:17 103:21 105:6,16 129:21</p> <p>stumbled 132:14</p> <p>style 117:12</p> <p>stylized 37:8</p> <p>subgroup 132:5</p> <p>subject 49:13 167:14</p> <p>subjects 89:17</p> <p>submit 145:11</p> <p>substantially 130:8,23</p> <p>substitute 51:6</p> <p>success 70:15 190:21</p>
--	--	---	--

successful 44:11 91:13 117:21 120:17	220:10 221:13,21	syntactic 64:24 67:2 72:2 116:21	53:9 55:7 57:4 63:11,16 67:21 77:10,18 80:18 81:15,16 82:11 87:3,5 92:23 119:2 120:23 133:5 136:11 137:14 138:21 142:13 148:16 149:3,18 157:10 164:11 167:23 172:14 181:10,13 185:22 193:5 213:22 222:5
successfully 27:18 118:22 214:19	summer 25:4	syntax 64:2 66:12	
succinct 118:24	super 73:14 199:22	system 3:8 5:5 12:17,20,21 13:3,20 14:3,23 15:1,3,4,8 16:3 19:9 20:24 34:19 37:18 40:18 41:13 47:7,8 49:1 54:15,17,20 55:4,10,15,22 56:1 60:15,16 61:6 62:9 76:4 80:21,24 84:12,24 88:2 91:23 95:16,19 96:13,14,17,24 97:1,4,6,11 106:19,21 108:11,12 110:22 111:7 127:17 133:3,4,6 135:10,15,19,24 136:13 137:19 138:2,5,14,22 139:3 140:20 141:5,14,15,24 142:7 143:13,19 144:11,22 145:14 152:17 156:2,3,6,10 157:12,18 158:9 159:15,16 160:9,10 161:8 162:19,24 164:11,19 170:2,10,12,21,2 4 171:7 172:11 174:21 178:23 181:10 190:13,18 191:1 192:1 199:13 200:10 215:22 216:3,17	
such-and-such 128:20	support 2:22 3:7,11 15:11 17:16 21:8 76:16 125:11 159:3,6 206:20		
sucked 107:13	supporting 21:10 35:3 196:13		
sucrose 69:7	supposed 19:18 47:2 130:7		
sudden 103:19	sure 8:6 20:24 45:23 48:21 52:5 57:9 60:6,9 61:21 62:1,12 93:16 100:1 103:6 104:16 106:9 108:14 112:9,12 147:9 155:10,13 156:17 157:2,6 158:11 159:17 170:5 171:4 173:6 177:16 179:15 187:9 191:8 202:11,14		
Sue 127:10 152:8,10 160:2 161:22 162:1 163:21 164:1,9 165:2 166:16 170:1,17 171:11 172:17 174:8 190:2 192:4	surfaced 180:24		
sufficiency 98:19 103:24	surface-basic 181:5		
sufficient 35:11 119:19	surgeon 69:6		
Sugar 69:6	surgery 69:20		
suggest 87:23 91:13 122:19 163:17	surprise 66:16		
suggested 148:6 189:14	surprised 215:24		
suggestions 210:7	surrounds 73:20		
suggests 58:18 148:2	suspect 162:10		
Suites 1:14	suspicion 116:8		
summarize 128:9 159:24	SUV 103:18		
summary 130:3 144:18 160:3	switch 25:12 26:7 163:22	systematically 48:5	
summative 3:22 12:21 14:22,24 15:1,4,23 16:1,2,11 17:15 18:8 22:10 24:19 35:4 63:4 79:23 109:5 114:18 115:9 124:12 148:19 153:1 188:1 198:19 199:8 218:13	syllables 177:5	systems 2:8 3:4 4:17 10:23 13:7 15:11 23:16 37:20 43:2,16 44:2,4,13,15,17, 18 47:5 50:1	
	symbolic 27:7		
	symbols 90:23		
	synonyms 29:18 45:15		
			<hr/> T <hr/>
			table 2:18 6:7 7:2,12 9:11 11:15 25:15 26:2 36:5 74:11,12,14 78:11 82:9 122:14 124:24 127:8 170:16 171:8 202:1
			tackling 52:12
			tailor 154:20 165:6
			tails 34:9
			take-home 34:23
			taking 40:16 62:15 76:8 83:21 94:8 95:15 107:9 123:21 171:9 182:2,4 195:8
			talent 201:8,20 202:4,6 203:17
			talk 6:11,21 13:22 15:5 25:13 26:1,18 34:17 35:6,24 46:10 47:10 51:5 53:10 60:7 63:13 64:4 65:5 85:18 87:11 94:24 96:1 99:1 101:13 105:11 106:11 107:17 111:1 117:11 125:3 126:3 127:14 136:6 145:15 152:14 163:9,14

<p>195:11,13 198:9 200:1,6 201:1 213:9 215:20 217:16 220:19 221:20 222:2</p> <p>talked 50:20,23 72:13 94:19,21 99:1 105:22 106:2 128:24 157:9 158:3,21 159:4 160:3,4 173:23 191:18 193:16 198:22 206:13</p> <p>talking 27:10 37:23 39:3 42:22 51:16 56:21 77:24 86:5 98:18 99:13 111:5 114:22 148:19 149:16 151:3 156:12 165:14 170:1 172:12 178:20,21,24 179:2,17,18,19 204:7 207:16 208:19 216:17 223:20</p> <p>talks 95:8 218:7</p> <p>target 29:17 205:13</p> <p>task 16:22 31:14 58:14 129:4,7 131:23 169:17 171:21 182:10 186:21</p> <p>tasks 16:12,13 54:1 55:9,12 58:13 70:15 117:19,22 118:3 130:13 181:24 186:23 193:14</p> <p>taxpayer 97:15</p> <p>teach 184:12</p> <p>teacher 3:17 13:4 18:1 28:7 33:5,7,10 34:18 37:14,15,21 38:4,6,10 118:16 140:12 141:2,17 143:11,14,23</p>	<p>144:1 149:24 159:10 218:17 219:20 220:4,13</p> <p>teachers 5:9 14:12 24:12 85:13 94:10 115:18 116:8,15,18 117:3 138:23 140:21 141:16 142:1,6,13,16 146:10 147:1,13,17 149:15 152:23 153:7 193:19 216:22</p> <p>teaching 3:15 13:20 91:3 94:12,13 116:23 117:19 186:4 217:22 220:19,23 221:12,15 222:15</p> <p>team 12:2 25:11 170:19 197:2 198:20</p> <p>teams 121:24 174:18</p> <p>technical 1:9 2:16,22 16:7 20:8 76:5 97:23 195:24 196:1,16</p> <p>technical-issues 167:5</p> <p>technically-driven 211:14</p> <p>technique 67:23 70:6</p> <p>techniques 63:24 64:3</p> <p>technologies 2:4 30:19 197:15</p> <p>technology 4:14,18,19 5:6 13:6 21:14,18 23:2,10,14,22 26:10,19 27:3,12,16 29:22 36:20 39:15,18 42:7 45:5 91:17,19 92:2</p>	<p>94:12 98:21 99:6 100:3,6,21 113:19 145:2,20 155:23 175:20 191:7,19 203:4,7 205:5 207:16,19 211:21 221:24 222:1</p> <p>technology-delivered 50:5</p> <p>technology-enabled 174:10</p> <p>technology-enhanced 16:6 17:4,9</p> <p>teenager 151:15</p> <p>ten 25:24 26:1 27:1 42:4 72:7 74:4 97:5 99:14 169:10 194:7 222:6</p> <p>tend 43:21 48:15 71:8 202:15</p> <p>tended 133:8</p> <p>tendency 47:2</p> <p>tends 148:5</p> <p>Tennessee 10:13 20:6</p> <p>tens 107:8</p> <p>tense 67:3</p> <p>tenses 67:5</p> <p>term 48:7 68:12,16 192:7 196:10</p> <p>terminate 62:14</p> <p>terminology 198:18</p> <p>terms 23:22 31:2 33:17 35:16 48:12 53:21 56:20 58:17 70:13 73:6 76:23 84:7 85:9 92:6 95:3 102:17 109:5 113:9 131:17 141:16 145:13,18 153:9 154:14,18 159:18 162:5</p>	<p>173:5,18,23 175:11,13 177:11 182:21 184:21 186:16 187:10 188:7 194:6 199:14 206:22,24 208:21</p> <p>term-term 68:14</p> <p>test 16:1,4,19 17:6,15,17 18:12 22:14 27:4 44:6 45:22 52:16 55:2,14 56:14,15 57:4 58:4,6,9,23 59:12,13 62:11,15 81:21,22 82:2 83:20 84:7 87:14,15,20,21,2 4 88:19 89:6 93:13 94:1 107:2,7 113:11 116:6 117:2 118:10,13 124:1 142:24 143:2,3,7 146:24 150:17 151:3,8 152:1 153:10 156:2 162:16,20 169:11 179:10 181:5 184:7,11 188:10,11 189:8 190:6 199:4 200:10 216:4,21 217:23 218:18 221:12,15</p> <p>testable 218:1</p> <p>tested 61:14 116:18 217:14</p> <p>testimony 226:5,7</p> <p>testing 14:23 16:23 18:10,12,13,15 25:2,3 29:16 32:21 49:5 56:21 58:20 59:19 61:12 76:24 82:15,19 86:24 87:12 92:20 94:11,15,17 97:19 104:19</p>
---	---	--	--

108:3 116:12,15 150:6 151:3,6,8,9,11 155:16 157:7 162:6,7 171:9 187:22 208:19 211:19 215:16 216:20,23 217:6,20	124:18,19 125:5 126:12 128:7 136:2 142:18 144:9 150:9 152:10 191:3 204:5 210:1,2 211:7 212:22,23,24 215:3 219:13,16,17 223:1,2,6 224:9 225:12	206:3 207:2,7 208:11,12,20 216:3 217:2 218:2,6 223:1	tight 195:22 196:12
tests 14:1,12 18:1 31:5 54:7 57:10 62:14 82:3 83:5 84:17 87:17 88:5 94:18 98:3,13 102:9 106:22 116:6,11,17 117:6 135:22 140:22 147:13 150:9 160:7 182:3,4 183:17,24 184:16 216:13,16,18 217:1 218:11,13,14,22 219:4,9	thankful 223:12	theme 28:2 144:16	tightly 196:13
text 29:22 54:21 65:19,20,22 68:2,4,18 69:2 70:19,21 93:2,8 136:13,19 137:4,9 138:20 141:3,8,9,17,19, 21,23 142:2,23 143:12,15,19,23 144:1	Thanks 25:10 40:24 50:10 71:15 120:8 128:6 135:4 144:5 150:22 152:7 161:22 215:4	themes 197:21 199:24 200:1	Tim 31:6
text-based 180:24 181:6	that's 8:2 19:8 23:4,12,20 27:10 28:12 29:22 30:15 37:18,24 38:12 39:12 40:5 42:14 44:1,20 50:9 52:1 55:16 66:11 69:5,6 72:10 74:21,24 76:10,14 77:5,6 79:8 83:1 92:10,19 96:24 97:21 98:11 103:11 105:11 106:22 108:10 110:13 116:19 122:6 124:4 132:1,17,21 133:1 135:16,22 137:21 143:8 144:24 145:12 147:2,11 155:8 165:19 173:15 176:11 179:22,23 182:7 183:2 184:9,12 186:21 187:19 188:6,15 189:17,19 192:18 194:23 195:9 200:23 201:6,9 202:6 203:12 204:3,22	themselves 16:18 153:21	timeline 15:15 18:19 24:23 85:22 96:3 195:23
texting 50:1		theoretical 70:14	timely 5:7 17:13
texts 64:18 68:6 138:18,23		theoretically 205:8	timer 114:3 210:15
textual 117:23		theories 180:20	tips 102:15
thank 9:8 11:7 20:5 25:11 26:5 36:3 40:9 42:1 50:9 52:19 59:21,22 61:2 62:18 71:10 74:1,15,17,19 113:21 115:11 117:7,8 120:10 123:7,8,10		theory 12:14 64:12 65:11 80:20 180:19 183:15	today 7:23 45:4 92:14 115:20,24 126:16 173:23 193:16 197:22 198:16 199:19 202:2 211:7,10 213:5 216:11 217:3,9 221:8 223:6 224:9
		thereafter 226:6	today's 4:13,22 7:19 8:15,21 21:17 210:12
		therefore 201:9	TOEFL 118:14
		third 3:3 30:10 57:8 144:7 176:16 211:2 224:23	tolerance 153:3,5 156:16 160:7 162:5,12
		Thirdly 218:14	tolerant 153:6
		thoughtful 193:3,9 223:7	tolerate 153:16
		thoughtfully 193:15	Tom 125:14
		thoughts 5:15 7:8 9:2 11:13 210:6	ton 14:12
		thousands 37:6 76:24 77:1 107:9 182:19	tool 64:17,21,23 65:9 67:18 70:14,15 73:21 80:5 90:21 93:7,14 123:24 160:23 162:17 200:16 220:18 222:14
		three-and-a-half 195:2	tools 12:19 14:11,14 15:18,22 24:1 64:20 97:8 115:5 124:4 148:22 149:12,15 191:13 222:3,23
		threefold 2:21	top 1:7 3:6 4:8
		threshold 33:12	
		throughout 12:8 15:24 16:10 23:14 24:13,17,22 32:19 193:21 216:1 222:20	
		throw 181:1	
		thrown 115:1	
		thumbs 92:16 93:3	
		thus 49:7	
		tie 196:12	

7:20 8:9 15:16 54:6 116:5,22 121:15 224:22 225:10	transcription 78:5	158:16 165:21 166:4,23 179:6,7 189:11 190:7 191:8 195:2,7 196:17 197:1 199:17 204:14 206:14	93:15 105:8 109:10 136:15 174:1 175:21 188:21
topic 7:9 35:1 140:2 143:1,4 223:8	transferred 91:12	trying 28:3 29:14 30:6 39:14 44:22 45:5 47:4 51:3 76:9 81:20 84:3 105:12 107:4 113:6 114:17 123:13 126:10 128:24 130:20 135:19 141:24 147:18 156:15 165:10 166:9 172:9 174:23 178:3 183:11 185:23 187:4 189:10,21 195:9 201:12,22 205:24 207:1 208:17	types 16:5 17:1 19:8 22:19 23:23,24 27:5,8 33:6 37:17 65:20 81:17 90:12 104:21 105:19 118:19 123:18 162:21 174:20 175:9,18 181:7,10 202:15
topics 2:20 8:22 223:22	transfers 136:18	Trek 42:14,17	typewriting 226:6
totally 207:12	transition 190:6 191:18,22 193:3	tremendous 207:22	typical 61:5
touch 131:11 213:4	translate 141:8	trend 203:11	typically 28:12 31:16 33:17,21 34:1 37:2,4 78:13 82:14,18 131:23 146:4,5 149:15
touching 39:24	translates 138:11 150:12	trick 77:16	<hr/> U <hr/>
toward 21:11 42:13 80:5 95:2 140:5 183:14 203:1	translation 141:4	tried 43:20 106:3 197:20	U.S 1:5 219:24 224:17
towards 14:5 91:18 179:7 184:5 198:21 199:17 206:14	Transparency 119:2	trip 225:13	ubiquitous 151:12 152:3,5
trace 76:6	transparent 2:17 3:4 13:12,16 93:4 119:3 135:9	trouble 216:2	UK 169:21 197:18
track 7:19 21:1	traveled 224:9	true 31:4 45:10 119:22 129:22 155:8 180:11 183:5,8 224:6 226:7	ultimate 14:24 28:10
tracking 149:4	treatment 135:22	truly 9:2 16:22 151:19 224:4	ultimately 14:5 16:20 166:15 175:10
tracks 195:17,18	treatments 54:8	try 19:12,21 26:24 33:2 41:7,23 47:6 49:2 52:9 74:4 75:4,10,17,21 79:1 80:2 82:13 86:12 87:13 99:6 105:4 112:7 114:15 126:24 127:24 128:8 134:15 135:15 138:20 144:22	unbiased 31:17
traditional 52:10	Trek 42:14,17	turn 9:5 22:4 23:7 24:7 120:12 127:12 144:6 195:4	uncertainty 213:15
train 37:16 60:8 79:3 166:19	tremendous 207:22	turnaround 77:22 154:17 207:5	undeniably 130:9
trainable 37:14	trend 203:11	turned 23:3 107:3 138:23 169:15	undergraduate 118:14
trained 30:21 63:16 81:11	trick 77:16	turns 145:8 146:12	underlies 67:20
training 32:18 55:16 77:13,14 94:15 136:12 166:18 180:14 199:1	tried 43:20 106:3 197:20	tutorial 35:21	underlying 16:12 43:22 53:20
traits 27:22 31:24 32:9,10 116:24	triple 225:13	tutoring 40:18 63:11 67:20 84:24 136:10	underpinnings 12:15
trajectory 175:20	trouble 216:2	tweak 109:7 110:14	understand 28:5,7,8,13
transaction 95:11	truly 9:2 16:22 151:19 224:4	tweaked 133:4	
transcribe 77:4 78:8	try 19:12,21 26:24 33:2 41:7,23 47:6 49:2 52:9 74:4 75:4,10,17,21 79:1 80:2 82:13 86:12 87:13 99:6 105:4 112:7 114:15 126:24 127:24 128:8 134:15 135:15 138:20 144:22	twenty 72:8	
transcribed 78:1	turn 9:5 22:4 23:7 24:7 120:12 127:12 144:6 195:4	two-day 56:17	
transcribers 78:14	turnaround 77:22 154:17 207:5	two-dimensional 153:23	
transcript 8:15,16 224:20	turned 23:3 107:3 138:23 169:15	type 22:18,24 27:19 61:6 71:23 78:15 79:22 80:19,24 92:12	

64:11 65:18,19 67:14 78:8 104:16,17 105:4,12 106:9 123:13 132:8 142:4 181:4 186:3 190:10 199:19	untrained 138:18	Vantage 29:4	Venn 149:12
understanding 12:11 70:10 80:17 133:13 190:4	unusual 213:19	variable 104:17	venue 3:3
understands 202:12	unwilling 178:8	variables 67:15 149:1	verbal 141:4
underway 49:16	unworkable 219:1	variably 173:18	verbs 67:10 122:16
undoubtedly 134:18	up-front 95:18 96:2,12	variance 130:17 140:8 145:1 180:6,7 181:14	verified 157:6
unemotional 31:17	upon 87:18	variant 32:22	version 16:24 25:6 164:19 214:17
unemployment 122:5	upper 151:19	variants 30:5	versus 73:16 81:21 82:2 110:19 198:10
unfair 134:14	upset 61:22	variation 85:12 116:21	via 31:24 123:23,24
unfortunate 214:6	upside 133:11	variations 68:15	vibrate 8:7
Unfortunately 208:2	useful 3:8 5:8 13:21 64:22 171:17 172:6 174:13 181:23 191:8 193:17	varies 92:3 173:24	Vic 9:11,14 125:3,5 126:13 195:5,8 209:20,22 210:1
unintended 134:18	user 138:3,13 139:7	various 63:24 64:3 66:2 73:3 88:8 115:5 140:22 167:12	video 123:24 151:14,15,16,21 198:23
union 98:2	users 96:16 119:4	vary 73:7,22	view 84:24 85:2 105:13 131:19 133:16 153:7
unique 24:9 54:14 194:4,9	usually 29:24 39:8 43:22 133:4 145:10	varying 8:23	viewpoint 9:1
unit 59:9 87:2 129:7	Utah 10:15,17 91:8	vast 29:9	viewpoints 8:23
United 21:24 32:19 43:1 49:6 52:21 112:24 215:11 216:13	utilities 97:10,12	vector 68:22	violence 122:3,6
university 9:18,21 10:12,22 25:17 62:22,24 169:21	utility 32:13	vectors 73:23	violets 46:19
unless 94:16	<hr/> V <hr/>	vendor 89:23 155:9 158:22 164:2,17 166:17,20 167:2,9 169:12,17,20 171:7 177:20 178:3	virtually 47:22
unlike 54:12	vague 138:8	vendors 30:24 32:24 38:20 92:10,22 99:19 100:4 113:1,11 147:24 148:15 149:8 150:1 165:23 166:10,13 167:7,18 168:11,20 169:10 171:12 172:19 175:5 178:4,14 189:17 194:15 202:3 209:7 222:8	vis-a-vis 173:11
unprompted 53:17	valid 4:3 5:7 117:17 181:3 188:24 192:17 220:24	valid 4:3 5:7 117:17 181:3 188:24 192:17 220:24	vision 32:8 175:9
unreasonable 58:21	validated 34:14	validation 78:10 164:19 166:18	visionary 32:15 54:13
unscripted 213:3	validation 78:10 164:19 166:18	validity 31:2 109:23 133:17 140:9 164:10,13 184:23	voice 32:12,16 35:22 39:15,21 46:6 77:9 123:23 127:9
unsuccessful 110:23	valuable 142:12,17	value 67:23 167:18	voice-recognition 39:23
	valuing 134:2	Vanderark 125:15	volume 41:22,24 113:17
	Vanderzande 9:22	vendor's 155:5 158:19	Vuchic 9:14 125:3,5 195:8 209:20,22
			<hr/> W <hr/>

<p>Wagner 183:13</p> <p>wait 75:18 209:21 216:20</p> <p>waiting 216:9</p> <p>walk 191:23</p> <p>Walsh 120:21</p> <p>War 30:10</p> <p>warranted 207:23</p> <p>Washington 2:6 225:1</p> <p>wasn't 58:5 90:9 129:22 179:18 214:12</p> <p>watch 213:3</p> <p>watching 199:1</p> <p>water 181:2</p> <p>Watson 42:7 186:14 187:10</p> <p>ways 5:8 54:15 64:7 66:22 85:7 107:5 111:2 156:9,21 159:6 163:10 219:9</p> <p>weak 46:7 223:8</p> <p>weaknesses 221:20</p> <p>wealth 29:9</p> <p>weather 224:10</p> <p>Web 49:10 92:7,8</p> <p>Web-based 27:21</p> <p>Webinars 209:15</p> <p>Website 8:1,4,12,17 42:10 141:1 209:17 217:24 224:17 225:5</p> <p>week 42:2 62:23 139:16 215:21 224:18</p> <p>weeks 61:11,15,24 209:14 223:15</p> <p>weight 129:13</p> <p>weights 60:24 129:7,9,12 134:13</p>	<p>welcome 219:15 225:8</p> <p>well-constrained 81:2 111:14</p> <p>well-distributed 207:18</p> <p>well-integrated 189:16</p> <p>well-known 25:19 200:19 202:18</p> <p>well-prepared 187:6</p> <p>well-trained 34:13</p> <p>we're 17:18</p> <p>Wes 11:9 19:18 47:2 60:5,6 61:2 71:15 72:10 104:11 174:17 186:11</p> <p>WHALEN 2:2 85:18 90:1 168:18 173:21 174:15 191:4 193:1 194:1 202:9 204:5 208:23 209:16 212:23 219:13,15 223:5</p> <p>whatever 59:5 93:4 132:24 156:5 158:2</p> <p>whatnot 195:21</p> <p>whatsoever 135:18</p> <p>whereas 84:16</p> <p>WHEREUPON 225:14</p> <p>whether 28:11 35:13 48:20 67:3 69:10 80:24 81:19 85:9 92:12 93:2 110:18 111:12 119:6 125:16 134:23 137:23 140:2,15 148:8 157:10 161:21 211:19,20 212:2,12,13 219:12</p>	<p>White 36:22</p> <p>whole 15:8 27:5 30:12 45:10 47:11 94:4 97:12 107:22 108:9 114:17 121:13 149:14,20 186:6 187:13 194:21 217:23</p> <p>whom 226:3</p> <p>whose 122:21</p> <p>wide 8:22 111:12</p> <p>widely 43:24</p> <p>wider 116:6 125:23</p> <p>wife 102:23 103:1</p> <p>Wikipedia 73:12</p> <p>William 9:15</p> <p>Williamson 114:12 115:16,17 117:9,10 210:24 213:1,2</p> <p>willingness 175:13</p> <p>win 203:21</p> <p>windows 7:24</p> <p>winging 152:11</p> <p>winner 208:7,10</p> <p>win-win 168:9</p> <p>wish 7:14,15 79:24</p> <p>Woestehoff 210:24 215:5,9,10 219:14</p> <p>wonder 174:8</p> <p>wonderful 6:4 45:2 196:9 210:12 225:12</p> <p>wondering 81:15</p> <p>word-based 73:1</p> <p>wording 141:13</p> <p>word-match 137:22</p> <p>work 11:24 12:1,2,5,11 20:10,12,13,22</p>	<p>21:3,11,15,16,18 24:24 25:3 26:11 27:13 28:9 31:5,10 35:16 40:8 43:6 45:1 48:24 49:24 50:7 56:22 65:7 73:18,19 80:5 81:1,16 82:1,2 83:24 84:6,16 86:24 92:8 99:17 101:4 107:14 108:1 110:12 112:19 113:5 124:9 128:13,14 129:6,16,18 130:18 132:3 134:24 142:5 146:7 149:14 151:18 155:9,12 158:22 163:3 164:11 165:9 168:20 169:7,13 171:10 173:3 182:12 189:5 191:20 194:7,14 195:1 199:17 200:17 201:5,23</p> <p>worked 121:24 129:19 130:6 157:5 166:2 169:9 189:5 202:3 204:2 214:13,24</p> <p>working 16:15 20:7,8,10 25:1 49:17 76:17 82:11 97:18 99:19 101:10 104:1 113:7 114:23 125:14 128:10 146:9 148:1,2 155:7 158:11 161:4 166:13 168:17 169:19 173:2 179:11 189:7 191:19 209:3 211:12 221:1,18 222:5,6</p> <p>works 43:23 62:1 64:23 87:2 135:9 137:12 144:20</p>
---	---	--	---

<p>170:18 179:8,10 190:7 195:3</p> <p>workshops 122:10</p> <p>world 31:12,13 70:10 121:24 165:7 185:20 194:4,16</p> <p>worlds 47:6</p> <p>worried 42:2</p> <p>worry 30:14 217:1</p> <p>worth 117:19 150:15 182:10 190:23 214:4 215:2</p> <p>W-Pal 140:11 142:6</p> <p>wrap 6:18</p> <p>wrapped 22:2</p> <p>write 28:21,23 33:11 37:15 40:23 52:4 53:5 57:15 76:10,13 80:3 90:17 99:23 104:19 134:20 136:24 140:12 144:24 146:20 169:9,16 170:13 188:19 219:15</p> <p>writer 28:23,24 30:6 64:14 145:12 146:20</p> <p>writers 28:6 35:23 66:5,6,9,15,16,1 8,19 67:7,9,17</p> <p>writing 29:1 31:10,16 32:3,4,5,8 33:5,6,23 34:24 35:17,18,21 36:21 37:8,11,17,24 40:17 66:4,15,19 76:6,21,22 83:7,9,11,14,15, 17,19 84:2 88:3,17 91:9 99:16 100:2 104:21 105:8,10 109:2,21 110:15,16,18</p>	<p>111:6,8,9,13,14, 16,18 117:1 132:22 136:20,22 139:2 145:12 146:2,6,8,11,14, 15,17,18,22 147:19 148:4 149:7,11,19 151:5 167:12 170:15 171:6,18 172:1 173:13 176:24 177:2,4 181:17,18 182:6 220:5</p> <p>writings 37:6</p> <p>written 25:18 27:13 28:14 44:7,8 65:10 77:2 80:14 85:4 91:7 95:5 210:20</p> <p>wrong 29:15 104:4 105:9 138:13 162:9</p> <p>wrote 111:1 183:13 197:19</p> <hr/> <p style="text-align: center;">X</p> <hr/> <p>X=12 79:14</p> <p>X=5 45:23</p> <p>X=7 79:14</p> <p>Xbox 197:13</p> <p>x-ray 54:18</p> <hr/> <p style="text-align: center;">Y</p> <hr/> <p>yellow 20:1 114:4,5 210:16</p> <p>yet 35:7 44:24 77:18 111:18 121:14 151:4 166:3 201:22 216:17 218:2,19</p> <p>yielding 203:8</p> <p>yields 182:13</p> <p>younger 35:23 75:20 77:2,18</p> <p>yourself 206:10</p> <p>yourselves 9:12 211:2</p>	<hr/> <p style="text-align: center;">Z</p> <hr/> <p>zero 45:24 46:1,20 69:19 210:17</p>	
---	--	--	--