

# National Assessment Governing Board

## Committee on Standards, Design and Methodology

November 20, 2015  
10:00 am – 12:30 pm

### AGENDA

10:00 – 10:05 am	Introductions, Welcome to New Members, and Review of Agenda <i>Andrew Ho, COSDAM Chair</i>	
10:05 – 11:20 am	<b>CLOSED SESSION:</b> Update on Maintaining Trends with Transition to DBA <i>Andreas Oranje, Educational Testing Service</i>	Attachment A
11:20 am – 12:10 pm	<b>CLOSED SESSION:</b> Technology and Engineering Literacy Achievement Levels Setting <i>Steve Fitzpatrick, Pearson</i>	Secure materials sent under separate cover
12:10 – 12:15 pm	<b>ACTION:</b> Resolution for Governing Board Approval of NAEP Technology and Engineering Literacy Achievement Levels for Grade 8 <i>Andrew Ho, COSDAM Chair</i>	
12:15 – 12:25 pm	NAEP Linking Studies <i>Andrew Ho, COSDAM Chair</i>	Attachment B
12:25 – 12:30 pm	Information Items <ul style="list-style-type: none"><li>• Update on Evaluation of NAEP Achievement Levels</li><li>• NAEP Job Training Preparedness Report</li><li>• Student Engagement in NAEP: Critical Review and Synthesis of Research</li></ul>	Attachment C Attachment D Attachment E



## Update on Maintaining Trends with Transition to Digital Based Assessment (DBA)

As NAEP transitions from paper to digitally-based assessment, an important question is how this transition affects trend reporting. To address this question we have done two things:

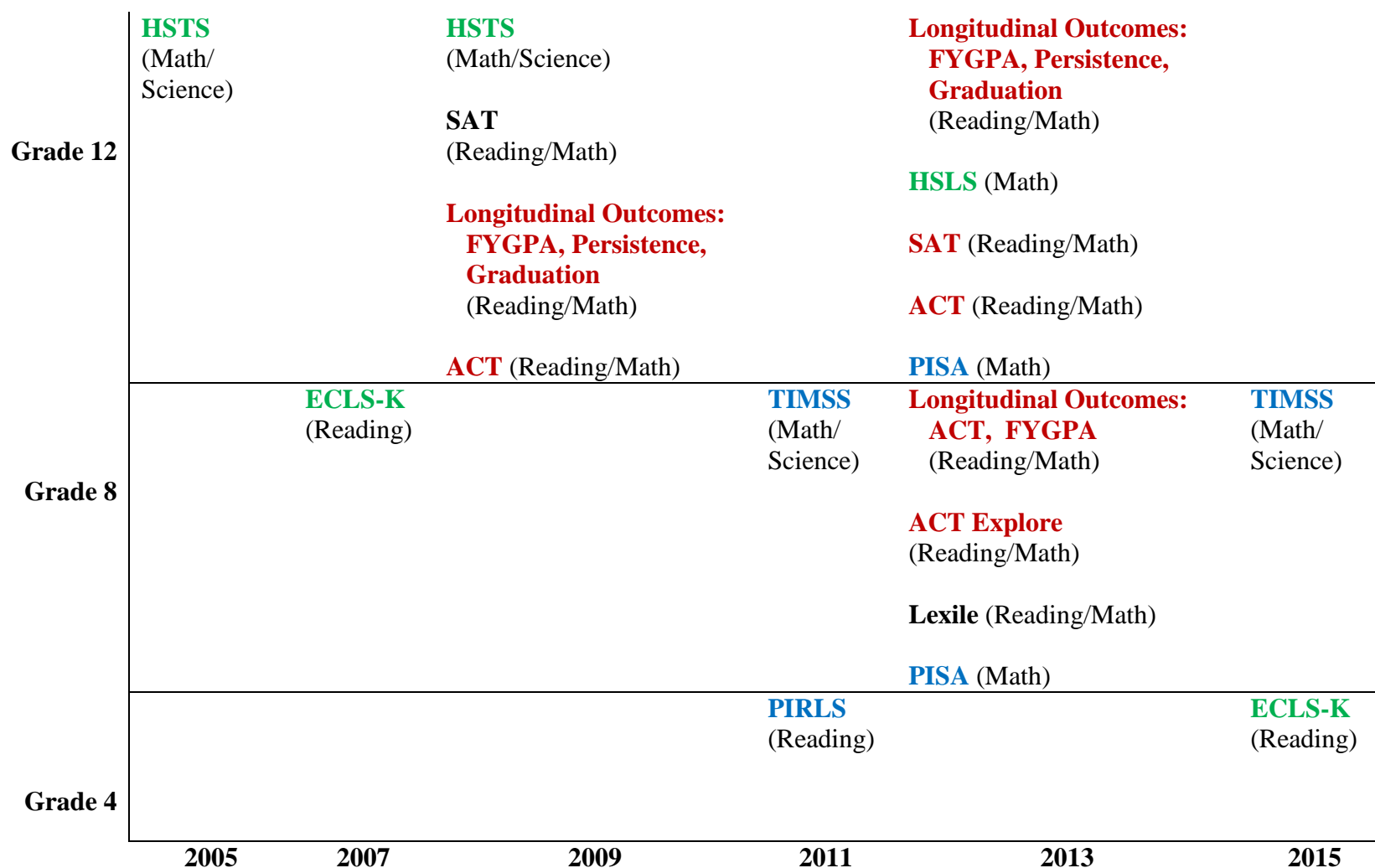
- (1) Designed, implemented, and extended bridge studies to investigate the effect of mode changes on score distributions;
- (2) Developed a decision tree to describe the key factors for subsequent analysis and decision making about trend reporting.

(1). Two bridge studies have been planned, one of which is currently being executed. Data collection for the first bridge study was part of the 2015 operational administration and entailed national samples in all three grades for Math, Reading, and Science. In these samples, a tablet-based version of the various NAEP instruments was administered on NAEP-provided tablets and analysis is currently under way. The goal is to compare the results from these digitally-based assessments to the paper-based assessments. The second bridge study currently planned would occur in 2017 in Math and Reading in 4<sup>th</sup> and 8<sup>th</sup> grade and entails small state-level samples participating in the paper-based assessment alongside larger state-level samples participating in the tablet-based assessment. Some tentative sample sizes have been proposed for the various components and are under discussion. The goal of this second study would be to (a) look at the stability of the mode differences (if any) across years (2015 and 2017) and (b) to estimate mode differences at the state level.

(2). A decision tree was developed as a way to establish *a priori* decision parameters in preparation for the analysis and to reduce hindsight biases. As discussed previously by COSDAM and made explicit in a Governing Board Resolution on trend results recently adopted, the question is not about whether to report trends, but how to report trends. The decision framework has been set up accordingly. At the highest level, there are two chained questions: (a) Do we measure the same construct across modes and (b) If so, are (construct-irrelevant) mode differences constant across student groups. Answering those questions is complicated and the decision tree attempts to connect sources of evidence to outcomes as they relate to how trend could be reported in accordance with the policy. Key factors that are brought to bear are dimensionality and model-data fit, national student group differences, and state-level differences, among many other less prominent factors.

In this presentation, we will provide COSDAM an overview of the principles that were used to develop this decision tree and will present the tree itself in a scaffolded manner. Subsequently, we will share initial, observed score results comparing paper and tablet based percent correct and missing rates by various student groups to give an impression of the direction of differences. These are not (yet) scaled or equated. The session is closed because these data have not yet been released.

## NAEP Linking Studies (2005 – 2015 NAEP Administration)



Green = Other NCES assessments; Blue = International assessments; Red = Assessments from state longitudinal data systems; Black = other



## NAEP Linking Studies

NCES has conducted a variety of studies that link NAEP to other assessments or data sources. The Governing Board has also conducted several NAEP linking studies as part of its research program on academic preparedness for college. A brief summary of the studies that have been conducted over the past 10 years (or are currently planned or underway) is provided below:

- **2005 HSTS:** NCES periodically surveys the curricula of our nation's high schools and the course-taking patterns of high school students through its High School Transcript Study (HSTS). In conjunction with the administration of 12th-grade NAEP assessments, the HSTS also offers information on the relationship of student course-taking patterns to student achievement at grade 12. Transcripts were collected from seniors who graduated in 1987, 1990, 1994, 1998, 2000, and were collected again in 2005. Results from the 2005 study can be found at: <https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2007467>
- **2007 NAEP-ECLS-K:** NCES conducted this study to link results from the Early Childhood Longitudinal Study-Kindergarten Class of 1998-1999 (ECLS-K) and the NAEP 8th-grade assessments. The purpose of the study was to 1) examine the relationship between ECLS-K reading proficiency levels and 8th-grade NAEP achievement levels, and 2) explore the relationship between reading performance at earlier grades and performance on the 8th-grade NAEP reading assessment. The results were published in: Dogan, E., Ogut, B., & Kim, Y. (2015). Early childhood reading skills and proficiency in NAEP eighth-grade reading assessment. *Applied Measurement in Education*, 28(3), 187-201.
- **2009 Preparedness Research**
  - **Statistical Linking of NAEP and the SAT:** The purpose of this study was to identify a reference point or range on the NAEP 12th-grade reading and mathematics scales that might be associated with the College Board's SAT preparedness benchmarks. The NAEP and SAT scores for 12th-grade students who had taken both assessments in 2009 were the basis for this linking. The report based on the results of this study can be found at: [https://www.nagb.org/content/nagb/assets/documents/what-we-do/preparedness-research/statistical-relationships/SAT-NAEP\\_Linking\\_Study.pdf](https://www.nagb.org/content/nagb/assets/documents/what-we-do/preparedness-research/statistical-relationships/SAT-NAEP_Linking_Study.pdf)
  - **Longitudinal Analyses of Performance on NAEP Related to Performance in College and Other Outcomes of Florida Students:** The purpose of this study was to relate NAEP scores to ACT and SAT scores, college performance and

other outcomes. Working with Florida state officials and their longitudinal database, scores for students who had participated in the 2009 NAEP 12th-grade assessments and were subsequently enrolled in Florida's public colleges in 2010 were linked to a variety of outcome indicators. Although data are still being collected and analyzed, the initial report can be found at:

[https://www.nagb.org/content/nagb/assets/documents/what-we-do/preparedness-research/statistical-relationships/Florida\\_Statistical\\_Study.pdf](https://www.nagb.org/content/nagb/assets/documents/what-we-do/preparedness-research/statistical-relationships/Florida_Statistical_Study.pdf)

- **2009 HSTS:** The most recent installment of the HSTS was in 2009. The goals and design of the study were similar to those of earlier administrations. Results from the 2009 study can be found at: [http://www.nationsreportcard.gov/hsts\\_2009/](http://www.nationsreportcard.gov/hsts_2009/)
- **2011 NAEP-TIMSS:** NCES initiated this study in an effort to link the National Assessment of Educational Progress (NAEP) scale to the Trends in International Mathematics and Science Study (TIMSS) scale so that states could compare the performance of their students with that of students in other countries. The study was conducted in 2011 with eighth-grade students in all 52 states/jurisdictions that participated in the NAEP mathematics and science assessments. The report based on the results of this study can be found at: [https://nces.ed.gov/nationsreportcard/studies/naep\\_timss/](https://nces.ed.gov/nationsreportcard/studies/naep_timss/)
- **2011 NAEP-PIRLS:** The purpose of this study was to obtain a statistical comparison between NAEP and the Progress in International Reading Literacy Study (PIRLS). The results of the 2011 NAEP grade 4 reading assessment were expressed in terms of the metric of the 2011 PIRLS assessment thereby providing international benchmarks for the NAEP grade 4 reading achievement levels. The report based on the results of this study can be found at: <http://files.eric.ed.gov/fulltext/ED545246.pdf>
- **2013 NAEP-HSLS:** Data for students who had participated in both the 2013 NAEP 12th-grade assessments and the 2009 High School Longitudinal Study (HSLS) were linked so that information from the HSLS student and parent questionnaires could provide a broader context for understanding NAEP results. In addition, the study explored using the relationship between the HSLS questionnaire variables and NAEP scores to predict NAEP mathematics scale scores for the full HSLS sample. The results from this research study are under review by NCES.
- **2013 NAEP-PISA:** NCES conducted a pilot study to investigate the feasibility of creating a statistical link between the NAEP mathematics scale and the Program for International Student Assessment (PISA) mathematics literacy scale. Two states that participated in the 2013 NAEP state-level 12th-grade pilot and had participated in the 2012 PISA were included in this study. In each state, additional samples of students in grades 9, 10, and 11 were administered a version of the NAEP mathematics assessment. Although it was determined that establishing a statistical link between NAEP and PISA is feasible, the validity of the predicted PISA results requires further evaluation.

- **2013 NAEP-Lexile® Study:** The Lexile® framework and measures (owned by MetaMetrics®) include a vertical reading scale that spans grades 1 to 12, in addition to benchmarks for college and career readiness. The purpose of the study was to identify scores on the NAEP scale that correspond to preparedness benchmarks on the Lexile scale. To accomplish this link, a subsample of students in the 2013 NAEP assessment were administered Lexile items. Although it was determined that establishing a statistical link between NAEP and the Lexile measure is feasible, the validity of the results requires further evaluation.
- **2013 Preparedness Research:** As part of the Governing Board’s preparedness research agenda, a variety of statistical linking studies are planned or currently underway with the 2013 NAEP data. They include 1) planned linking of NAEP and ACT at the national-level and with a group of select states, 2) linking NAEP and SAT scores within one state, 3) linking to longitudinal databases at grades 8 and 12 with a group of select states, and 4) linking grade 8 NAEP and EXPLORE® with a group of select states. Results from the NAEP and EXPLORE linking study were shared at the August, 2015 Governing Board meeting.
- **2015 NAEP-ECLS-K:2011:** NCES conducted this study to link results from the Early Childhood Longitudinal Study-Kindergarten Class 2010-2011 (ECLS-K:2011) and the NAEP 4th-grade assessments. Students in the ECLS-K:2011 study who were also sampled for NAEP in 2015 were asked to complete a supplemental SES-related questionnaire at the conclusion of the NAEP administration. These student responses will be compared to responses provided by parents to similar SES-related questions. In addition, this study will make it possible to explore predictors of NAEP reading performance based on data collected from kindergarten to third grade as part of ECLS-K:2011.
- **2015 NAEP-TIMSS:** NCES plans on conducting the analysis for a national-level linking of the 2015 NAEP-TIMSS data.

### **Evaluation of NAEP Achievement Levels**

**Objective** To receive a brief informational update on the current status of the independent evaluation of NAEP achievement levels that is being performed by the National Center for Education Evaluation and Regional Assistance (NCEE), part of the Institute for Education Sciences (IES). Ongoing updates will be provided at each COSDAM meeting.

### **Background**

The NAEP legislation states:

The achievement levels shall be used on a trial basis until the Commissioner for Education Statistics determines, as a result of an evaluation under subsection (f), that such levels are reasonable, valid, and informative to the public.

In providing further detail, the aforementioned subsection (f) outlines:

#### **(1) REVIEW-**

- A. IN GENERAL- The Secretary shall provide for continuing review of any assessment authorized under this section, and student achievement levels, by one or more professional assessment evaluation organizations.
- B. ISSUES ADDRESSED- Such continuing review shall address--
  - (i) whether any authorized assessment is properly administered, produces high quality data that are valid and reliable, is consistent with relevant widely accepted professional assessment standards, and produces data on student achievement that are not otherwise available to the State (other than data comparing participating States to each other and the Nation);
  - (ii) whether student achievement levels are reasonable, valid, reliable, and informative to the public;-
  - (iii) whether any authorized assessment is being administered as a random sample and is reporting the trends in academic achievement in a valid and reliable manner in the subject areas being assessed;
  - (iv) whether any of the test questions are biased, as described in section 302(e)(4); and

- (v) whether the appropriate authorized assessments are measuring, consistent with this section, reading ability and mathematical knowledge.

(2) REPORT- The Secretary shall report to the Committee on Education and the Workforce of the House of Representatives and the Committee on Health, Education, Labor, and Pensions of the Senate, the President, and the Nation on the findings and recommendations of such reviews.

(3) USE OF FINDINGS AND RECOMMENDATIONS- The Commissioner for Education Statistics and the National Assessment Governing Board shall consider the findings and recommendations of such reviews in designing the competition to select the organization, or organizations, through which the Commissioner for Education Statistics carries out the National Assessment.

### **Evaluation of NAEP Achievement Levels Contract**

The National Center for Education Evaluation and Regional Assistance (NCEE), part of the Institute for Education Sciences (IES), will administer the Evaluation of the NAEP Achievement Levels. On September 29, 2014, NCEE awarded a contract to The National Academy of Sciences to perform this work.

Objectives for the evaluation include the following:

- Determine how "reasonable, valid, reliable and informative to the public" will be operationalized in this study.
- Identify the kinds of objective data and research findings that will be examined.
- Review and analyze extant information related to the study's purpose.
- Gather other objective information from relevant experts and stakeholders, without creating burden for the public through new, large-scale data collection.
- Organize, summarize, and present the findings from the evaluation in a written report, including a summary that is accessible for nontechnical audiences, discussing the strengths/ weaknesses and gaps in knowledge in relation to the evaluation criteria.
- Provide, prior to release of the study report, for an independent external review of that report for comprehensiveness, objectivity, and freedom from bias.
- If the optional tasks are authorized by ED, plan and conduct dissemination events to communicate the conclusions of the final report to different audiences of stakeholders.



**Design:**

This study will focus on the achievement levels used in reporting NAEP results for the reading and mathematics assessments in grades 4, 8, and 12. Specifically, the study will review developments over the past decade in the ways achievement levels for NAEP are set and used and will evaluate whether the resulting achievement levels are "reasonable, valid, reliable, and informative to the public." The study will rely on an independent committee of experts with a broad range of expertise related to assessment, statistics, social science, and education policy. The project will receive oversight from the Board on Testing and Assessment (BOTA) and the Committee on National Statistics (CNSTAT) of the National Research Council.

Members of the interdisciplinary review committee were selected in early 2015 (see below), and the committee is expected to meet over the course of 2015. The report from the evaluation is expected to be released in 2016 and will be announced on <http://ies.ed.gov/ncee/>.

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Dr. H. Russell Bernard	University of Florida
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Dr. Bernard L. Madison	University of Arkansas
Dr. Scott Norton	Council of Chief State School Officers
Dr. Sharon Vaughn	The University of Texas at Austin
Dr. Lauress L. Wise	HumRRO

Additional information about the Committee and project activities is available at: <http://www8.nationalacademies.org/cp/projectview.aspx?key=49677>. The first Committee meeting took place in Washington, DC on February 19-20, 2015. Governing Board staff attended the open session and made a presentation to the Committee on the history of the NAEP achievement levels setting activities. The second meeting of the Committee took place in Washington, DC on May 27-28, 2015. Governing Board staff attended the open session on the afternoon of May 27<sup>th</sup> to listen to panel discussions about interpretations and uses of NAEP achievement levels. The final report is expected to be released in mid-2016.

## **NAEP Job Training Preparedness Report**

During the past 10 years, the Governing Board has commissioned more than 30 research studies to investigate whether the 12th grade NAEP reading and mathematics assessments could serve as indicators of students' academic preparedness for college and job training. The research results supported the claim that 12th grade NAEP assessments of reading and mathematics are indicators of academic preparedness for college. However, in the area of job training, the research studies have not supported the use of NAEP as an indicator of job training preparedness.

Given the prominence of career-readiness discussions across the country, it was determined that a synopsis of the Board's extensive job training preparedness research would be of interest to the field. The Job Training Preparedness Report was developed by Widmeyer Communications, under Governing Board contract ED-NAG-11-O-0005 for preparedness reporting.

The purpose of this report is to summarize the context, methodology, results, and conclusions of the Governing Board's job training preparedness research studies for NAEP. The types of job training research studies include content alignment, judgmental standard setting, and other areas. This report is written for educators, policymakers, researchers, and interested members of the general public. Therefore, this report is not intended to provide the full details of each study as those are fully documented on the Board's 12th Grade Preparedness Technical Report website (<http://www.nagb.org/what-we-do/preparedness-research.html>). For those who wish to review the studies and results in detail, links to the individual research study reports are embedded in the body of the job training preparedness summary report.



# The National Assessment of Educational Progress (NAEP)

## Research on Academic Preparedness for Job Training Programs

### **Developed for**

The National Assessment Governing Board  
under contract ED-NAG-11-0005  
by Widmeyer Communications/A Finn Partners Company

**September 2015**

# National Assessment Governing Board

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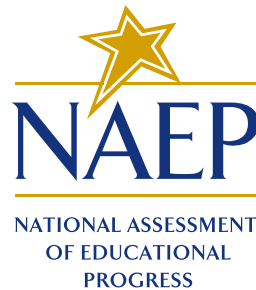
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### Suggested Citation:

The National Assessment Governing Board. (2015). *The National Assessment of Educational Progress, research on academic preparedness for job training programs*. Washington, DC: National Assessment Governing Board.

# The National Assessment of Educational Progress (NAEP)

## Research on Academic Preparedness For Job Training Programs



**Developed for**  
The National Assessment Governing Board  
under contract ED-NAG-11-0005  
by Widmeyer Communications/A Finn Partners Company

**September 2015**

# Acknowledgements

The National Assessment Governing Board would like to thank the following individuals and organizations, whose many contributions were instrumental in the 12<sup>th</sup> grade preparedness research effort and/or the development of this report:

- The National Assessment Governing Board panel of Technical Advisors on 12<sup>th</sup> Grade Preparedness Research
- The NAEP 12<sup>th</sup> Grade Preparedness Commission
- ACT, Inc.
- The College Board
- The Florida Department of Education
- Kristopher Kaase
- Widmeyer Communications

# I. Introduction

## Are the nation's 12<sup>th</sup> graders prepared academically for college and job training?

The National Assessment Governing Board has been conducting research for more than a decade to determine the potential of the National Assessment of Educational Progress (NAEP) of Reading and Mathematics at Grade 12 to answer this question. The Governing Board's hope was that NAEP could serve as an indicator of academic preparedness for college and job training. This report provides a summary of the Governing Board's groundbreaking job training preparedness research.

Measuring achievement at grade 12 is important because it is the end point of mandatory schooling for most students and the start of postsecondary education and training for most adults. However, most standardized tests taken by high school students are taken before 12<sup>th</sup> grade and are not representative of all students across the nation. **NAEP is the only source of nationally representative, 12<sup>th</sup> grade student achievement results.**

The Governing Board commissioned more than 30 research studies to find out if the Grade 12 NAEP could serve as an indicator of students' academic preparedness for college and job training. **The research results support the claim that 12<sup>th</sup> grade NAEP assessments of reading and mathematics are indicators of academic preparedness for college.**

Concurrent with the research on whether NAEP could serve as an indicator of students' academic preparedness *for college*, several of the studies commissioned by the Governing Board focused on whether NAEP could serve as an indicator of students' academic preparedness *for job training*. This research included:

1. content alignment studies between NAEP and the ACT WorkKeys assessments;
2. comparisons between NAEP and training performance requirements for five exemplar occupations using performance requirements from the U.S. Department of Labor's occupational information network, or O\*NET;
3. a judgmental standard setting study conducted to identify NAEP scale scores at grade 12 representing the knowledge and skills in reading and mathematics needed to qualify for entry into job training programs in five exemplar professions, and
4. a course content analysis study to examine whether NAEP knowledge, skills, and abilities are prerequisite for entering into a job training program in five exemplar professions.

**At this time the research results do not support the claim that NAEP Mathematics and Reading at Grade 12 data are indicators of *academic preparedness for job training*.**

Because of the importance of this research, the Governing Board pursued it even though there is no common definition of what is required to prepare high school students for job training, and there is no common process for preparing students for job training. The research highlighted that the knowledge, skills, and abilities required for job training vary widely across occupations. In addition, job training program instructors indicated there is wide variability in job training programs across and within occupations.

The purpose of this report is to summarize the context, methodology, results, and conclusions of the Governing Board's job training preparedness research studies for NAEP. This report is written for educators, policymakers, researchers, and interested members of the general public who are not assessment experts. Therefore, this report is not intended to provide the full details of each study. For those who would like to review the studies and their results in more detail, links and references to the individual research study reports are provided.



## II. The Context for Preparedness Research

**The environment for post-secondary education and training is diverse.** No single way exists to prepare for college or job training, and post-secondary education and training is provided by a wide array of public, private, and proprietary organizations. When the Governing Board began this initiative in 2004, defining the boundaries for this work was important.

### Defining Preparedness

Because NAEP is designed to measure reading and mathematics knowledge and skills, the focus of NAEP is academic preparedness for college or job training, rather than preparedness or readiness in general, which might include important, but non-academic skills such as persistence, time management, teamwork, conflict resolution, and adaptability.

The Governing Board has *generally defined preparedness* as the academic knowledge and skill levels in reading and mathematics necessary to be qualified for placement into a job training program (for the workplace context) or into a credit-bearing entry-level general education course that fulfills requirements toward a two-year transfer degree or four-year undergraduate degree at a postsecondary institution (for the college context).

For NAEP context, *preparedness for job training* requires that a student has the reading and mathematics knowledge and skills sufficient to qualify for placement into a job training program. There are a variety of entry points into job training, including apprenticeship programs, community college technical certificates and job training programs, on-the-job training programs, and vocational institute or certification programs.

### Additional Research Assumptions

As part of defining the boundaries for this work, the Governing Board made the following assumptions:

**Preparedness relates to eligibility rather than success.** Preparedness does not mean success in postsecondary job training.

**Preparedness relates to qualification to enter rather than being hired for a job.** Preparedness for job training refers to the reading and mathematics knowledge and skills needed to qualify for job training; it does not mean that a student is ready to be hired for a job.

**Preparedness for civilian job training relates to parallel military jobs.** To extend research findings to the military sector, a key assumption is that similar jobs in both the military and civilian sectors require approximately equal reading and mathematics knowledge and skills to qualify for entry.

**Multiple research studies and methods should be used.** No one study could comprehensively

address the feasibility and validity of using NAEP Grade 12 as a measure of academic preparedness for college and job training—including whether the same NAEP content applies to both. Multiple studies and methods should be conducted to see whether there is convergence or divergence of results, and to use these patterns to determine what, if any, valid conclusions can be drawn.

## III. Methodology

In determining if NAEP Grade 12 could serve as an indicator of students' academic preparedness for job training, the Governing Board sought input from a variety of experts, which led to development of a research plan of conducting multiple research studies using multiple methods. The academic preparedness for job training research is organized into three types of studies.

1. **Content alignment.** These studies are designed to determine the extent to which NAEP and another test measure similar content.
2. **Criterion-based judgmental standard setting.** These studies are designed to identify NAEP scores at the 12<sup>th</sup>-grade level representing the knowledge and skills in reading and mathematics needed to qualify for job training programs in five exemplar occupations.
3. **Course content analyses.** These studies examine whether NAEP knowledge, skills, and abilities are prerequisite for entering into a job training program.

### Five Exemplar Occupations

A group of technical experts identified a number of challenges with attempting to use NAEP as a measure of academic preparedness for job training (see [\*Technical Panel on 12<sup>th</sup> Grade Preparedness Research: Final Report\*](#).) Among the challenges identified were:

- **The wide variety of paths into job training** include on-the-job training, in-house training programs, formal apprenticeship programs, training programs in a community college, or training in vocational institutes or programs.
- **Although a number of resources exist for identifying knowledge and skills required to qualify for a job, there is very little information on the knowledge and skills to enter training for a job.**
- **Few occupations have a nationally consistent core knowledge and skills training.** Without a nationally consistent expectation for training in an occupation, it is not possible to report on academic preparedness for that occupation in a way that would be meaningful to everyone across the country.
- **Some occupations emphasize certain skills (e.g., simple numerical calculations) to the near exclusion of others (e.g., algebra, geometry).** Because NAEP assesses comprehensively for a domain (reading or mathematics), using the overall NAEP results for a domain may not provide meaningful information on preparedness for some occupations that only emphasize a subset of the domain assessed by NAEP.

- **Equivalence between similar occupations in the military and civilian sectors cannot be assumed.** Equivalence of jobs and job training for similar occupations in the military and civilian sectors needs to be confirmed because of the different environments in these job sectors.

To address these challenges, the technical experts recommended selecting exemplar occupations that best represent the entry-level reading and mathematics requirements for multiple sectors

of the labor force. The technical experts also recommended a multi-step process for identifying these exemplar occupations. This process excluded occupations that require a bachelor's degree, although some occupations may require a year or more of training. The Governing Board hired a contractor to conduct the identification process, which resulted in the selection of the following five exemplar occupations (see [Identification of Exemplar Occupations – Report, Appendix A](#), and [Appendix B](#)).

## Overview of Types of Research and Studies

To date the following research studies of NAEP as an indicator of academic preparedness for job training have been conducted, which are presented in the table below.

Type of Research Study	Status	Reports
Content alignment	Five studies conducted*	<a href="#">The Alignment of the NAEP Grade 12 Mathematics Assessment and the WorkKeys Applied Mathematics Assessment</a> <a href="#">The Alignment of the NAEP Grade 12 Reading Assessment and the WorkKeys Reading for Information Assessment</a> <a href="#">The Content Alignment between the NAEP and WorkKeys Assessments</a> <a href="#">Comparisons between NAEP and O*NET on Academic Preparedness for Job Training for Five Target Occupations</a>
Criterion-based judgmental standard setting	Two studies conducted	<a href="#">The Standard for Minimal Academic Preparedness in Mathematics to Enter a Job-Training Program</a> <a href="#">The Standard for Minimal Academic Preparedness in Reading to Enter a Job-Training Program</a>
Course content analyses	One study conducted	<a href="#">Job Training Programs Curriculum Study</a>

\* The report *The Content Alignment between the NAEP and WorkKeys Assessments* included both reading and mathematics studies.

1. Automotive Master Technician
2. Computer Support Specialist
3. Heating, Ventilation and Air Conditioning (HVAC) Technician
4. Licensed Practical Nurse (LPN)
5. Pharmacy Technician

These five occupations were the focus of studies of content alignment, criterion-based judgmental standard setting, and course content analyses.

In addition to these studies, the Governing Board convened a 10-person technical advisory panel to consider the research conducted to-date, produce ideas for future work, and to provide input on whether the Governing Board should continue to perform research on using NAEP as an indicator of academic preparedness for job training programs (see [\*NAEP Technical Advisory Panel Proceedings of the Symposium on Academic Preparedness Research\*](#)).

## Limitations for Other Research Designs

Additional research plans to examine statistical relationships or benchmarking of results against a reference group, such as program recruits, could not be pursued because of a lack of available data and settings that could support these plans. Few standardized assessments across employers exist that explicitly address preparedness for job training. The WorkKeys assessment was considered for this purpose,

however, performance results for WorkKeys examinees are not usually sufficiently available to conduct statistical linking with other assessments. One potential data opportunity was explored in Florida, but the sample was not large enough for analysis. (See the [\*NAEP Technical Advisory Panel Proceedings of the Symposium on Academic Preparedness Research\*](#) for more discussion on the challenge of accessing assessments related to job training.)

The Armed Services Vocational Aptitude Battery (ASVAB) is a multiple-choice test administered by the United States Military Entrance Processing Command used to determine qualification for enlistment in the United States Armed Forces. It is often offered to U.S. high school students when they are in grade 10, 11, and 12, and it is available to anyone eligible for enlistment. The needed partnerships for NAEP research with ASVAB were not available to the Governing Board when the first phase of the NAEP Preparedness Research Program was being planned and implemented. Hence, statistical linking of NAEP with ASVAB was not possible.

No benchmarking studies, which would involve administering NAEP at grade 12 to a reference group of interest (e.g., military recruits, job trainees), have been conducted. To date, the Governing Board has not successfully established the partnerships that would make a benchmarking study possible.

## IV. Results

The Governing Board's research was designed to explore the question, "Can NAEP Reading and Mathematics at Grade 12 serve as an indicator of academic preparedness for job training?" The results of each of the studies that attempted to answer this question are summarized below. More detailed information about each study and the results can be found by accessing the links provided to the full reports.

### Content Alignment

[Content alignment between the NAEP and WorkKeys assessments.](#) The WorkKeys assessment is a widely recognized, standardized test related to the workplace created by the ACT. *While most content alignment studies examine the alignment of an assessment to a corresponding set of standards, a 2010 study examined the alignment of the NAEP assessment to the WorkKeys assessment.*

The findings from the alignment study of the [NAEP Grade 12 Mathematics Assessment and the WorkKeys Applied Mathematics Assessment](#) found:

- The WorkKeys Applied Mathematics items do not assess content in the NAEP mathematics standards related to geometry, data analysis, statistics, probability, and algebra.
  - The NAEP mathematics items that aligned to the WorkKeys Applied Mathematics standards include geometry content; fractions, ratios, percentages, or mixed numbers; and basic statistical concepts.
  - The NAEP mathematics items either infrequently or do not assess at all content in the WorkKeys Applied Mathematics standards related to conversions, determining the best deal, finding errors, and calculating discounts or markups.
  - There is content represented by the NAEP mathematics standards that is not covered by the WorkKeys Applied Mathematics assessment, and there is content represented by the WorkKeys Applied Mathematics standards that is not covered by the NAEP mathematics assessment.
- The findings from the [Alignment Study of the NAEP Grade 12 Reading Assessment and the WorkKeys Reading for Information Assessment](#) found:
- The WorkKeys Applied Mathematics items that most frequently aligned to the NAEP mathematics standards were related to problem-solving applications of number operations and measurement.

- The WorkKeys Reading for Information items that aligned to the NAEP reading standards were related to locating and recalling information, causal relations, connecting ideas, drawing conclusions, providing supporting information, and determining word meaning in context.
- The WorkKeys Reading for Information items do not assess content in the NAEP reading standards related to literary reading passages and critiquing or evaluating reading passages.
- The NAEP reading items that aligned to the WorkKeys Reading for Information standards include identifying main ideas, determining word meaning from context, explaining the rationale behind a text, and identifying implied details.
- The NAEP reading items do not assess content in the WorkKeys Reading for Information standards related to understanding, following, and applying instructions; determining and applying general principles contained in workplace documents and applying them to similar and new situations; and to the decoding of workplace jargon.
- Skills measured by both assessments include identifying main ideas, details, and definitions; determining the correct meaning of a word based on context; explaining the rationale of a document; and identifying implied details.
- There is content represented by the NAEP reading standards that is not covered by the WorkKeys Reading for Information assessment, and there is content represented by the WorkKeys Reading for Information standards that is not covered by the NAEP reading assessment.

## Content Comparisons Made between NAEP and WorkKeys

### Mathematics

- NAEP Grade 12 Mathematics items and WorkKeys Applied Mathematics standards
- NAEP Grade 12 Mathematics standards and WorkKeys Applied Mathematics items
- NAEP Grade 8 and Grade 12 Mathematics Frameworks to WorkKeys cognitive targets for Applied Mathematics and Applied Technology
- NAEP Grade 8 and Grade 12 Mathematics items to WorkKeys cognitive targets for Applied Mathematics and Applied Technology
- NAEP Grade 8 and Grade 12 Mathematics Frameworks to WorkKeys items for Applied Mathematics and Applied Technology
- NAEP Grade 12 Mathematics items and WorkKeys Applied Mathematics standards
- NAEP Grade 12 Mathematics standards and WorkKeys Applied Mathematics items

### Reading

- NAEP Grade 12 Reading items and WorkKeys Reading for Information standards
- NAEP Grade 12 Reading standards and WorkKeys Reading for Information items
- NAEP Grade 8 and Grade 12 Reading items to WorkKeys cognitive targets for Reading for Information and Locating Information
- NAEP Grade 8 and Grade 12 Reading Frameworks to WorkKeys items for Reading for Information and Locating Information
- NAEP Grade 8 and Grade 12 Reading Frameworks to WorkKeys cognitive targets for Reading for Information and Locating Information

A [2014 content alignment study](#) examined similarities and overlap in the content and cognitive complexity between NAEP and WorkKeys. This study also included the NAEP grade 8 assessments and frameworks because experts have suggested that NAEP grade 8 may provide a better match to the academic content expectations of job training programs (Kilpatrick, 2012; Loomis, 2012). This study also included WorkKeys assessments for Applied Technology and Locating Information. The major findings from this study were:

- NAEP items do not adequately represent the WorkKeys content domain, as evidenced by the percentages of WorkKeys' mathematics and reading cognitive targets (52% and 72%, respectively) that were not matched to any NAEP item.
- Sixteen of the 24 (67%) content strands within the NAEP Mathematics Framework and one of the three (33%) cognitive targets within the NAEP Reading Framework were not matched to any WorkKeys item.
- A direct comparison of the content frameworks for the two assessments indicated that the majority of the elements of the NAEP Mathematics Framework, WorkKeys math targets, and WorkKeys applied technology cognitive targets reflected unique content. Unique mathematics elements were calculated for Grade 12 NAEP Math Framework (85%), Grade 8 NAEP Mathematics Framework (75%), WorkKeys math cognitive targets (61%), and WorkKeys applied technology cognitive targets (100%). Unique reading elements included grade 8 and 12 NAEP informational

reading framework (50%), WorkKeys reading cognitive targets (46%), and WorkKeys locating information cognitive targets (50%).

### Comparisons Between NAEP and O\*NET on Academic Preparedness for Job Training for Five Target Occupations.

This study identified grade 8 and grade 12 NAEP content that is relevant to training performance requirements for each of the five target occupations (i.e., the exemplar occupations described in the Methodology section), and, conversely, the training performance requirements that are relevant to NAEP content. The job training content was based on performance requirements adapted from O\*NET, the U.S. Department of Labor's occupational information network. The study also compared the levels of knowledge, skills, and abilities (KSAs) *needed for proficiency on NAEP reading and mathematics* with the levels of KSAs needed for entry into job training. The KSAs included in this study were a subset of KSAs identified as academically relevant by occupational experts from the O\*NET covering reading and mathematical related skills (e.g., written comprehension, mathematical reasoning, critical thinking, complex problem solving, deductive reasoning, etc.). The major findings from this study were:

### **Mathematics**

- The NAEP mathematics objectives most relevant to job training content were the objectives associated with the number properties and operations content area and the measurement content area (except for Computer Support Specialists). This was true for both grade 8 and grade 12 NAEP.



- The NAEP mathematics objectives that were least relevant to job training content were the objectives associated with geometry (except for HVAC) and algebra (except for LPNs). This was true for both grade 8 and grade 12 NAEP.

## Reading

- The NAEP reading objectives most relevant to job training content are the objectives associated with the locate/recall cognitive target for NAEP informational reading.
- The NAEP reading objectives that were least relevant to job training content were the objectives associated with the critique/evaluate cognitive target.

## Mathematics and Reading

- The range of mathematics and reading skills required by NAEP (both grade 8 and grade 12) is broader than the range of mathematics and reading skills required by job training.
- The percentage of the NAEP mathematics objectives linked to job training requirements for specific occupations decreased considerably from grade 8 to grade 12, indicating that as the complexity of the NAEP objectives increased from grade 8 to grade 12, their relevance to job training decreased. A comparable statement about whether including grade 8 reading resulted in more linked content is not possible because the NAEP reading objectives

are the same for grade 8 and for grade 12. (The differentiation at grade 12 relates to the type of texts.)

- Disconnects were found between the levels of KSAs required for proficient performance on NAEP and the levels of KSAs required for entry into job training such that higher levels of the KSAs were required in the NAEP assessments than for job training. The largest disconnects occurred between *grade 12 NAEP mathematics* and job training. Disconnects also occurred between grade 12 reading and job training. The disconnects in required levels of KSAs tended to be smaller when comparing grade 8 content to job training content, particularly for grade 8 reading, which demonstrated several “matches” with KSA levels for training content (most notably with written comprehension).

The results from the content alignment between the NAEP and WorkKeys assessments and the comparisons between NAEP and O\*NET on academic preparedness for job training for five target occupations do not support using NAEP to make judgments about the academic preparedness of 12<sup>th</sup> grade students to enter job training. These studies indicate that NAEP content covers a much wider domain of reading and mathematics than an assessment of job skills (WorkKeys), and the level of KSAs required for NAEP are higher than the KSAs needed for job training.

## Criterion-Based Judgmental Standard Setting

A judgmental standard setting study was conducted to identify grade 12 NAEP scores representing the knowledge and skills in reading and mathematics needed to qualify for job training programs in the five exemplar occupations. Panels of subject matter experts from across the country met to review the NAEP test and determine the minimal level of academic performance on NAEP that demonstrates preparedness for entry into a job training program, as well as for placement in an entry-level credit-bearing college course without need for remediation.

The major findings from the criterion-based standard setting study were:

### Mathematics

- Job-training groups struggled to find the mathematics they valued in either the framework or the test items. Because NAEP is more oriented toward pure mathematics than applied mathematics, much of the mathematics at grade 12 is well beyond what job-training groups would expect.
- The areas of number properties and operations and of measurement were the most important content areas for every occupational group, but these areas receive the least emphasis in the NAEP test. Job-training groups all wanted incoming students to know operations with fractions, decimals, and percents and their properties, which are addressed in the NAEP grade 8 objectives.

### Reading

- Little agreement was found between job-training and college-entry panelists on the reading knowledge and skills required of

students (2 of 25 or 8%). The two reading skills job-training and college-entry panelists agreed on were 1) identify main idea/key concepts/important information and 2) draw conclusions within/across texts. There were two other reading skills with which two of the occupational areas (computer support specialist and LPN) agreed with college-entry panelists: 1) interpret text, and 2) provide evidence to support an interpretation.

- Job-training panelists judged 11 (44%) of the reading skills as required of students for job training, while college-entry panelists did not judge these skills as required. In addition, there were 10 (40%) reading skills which job-training panelists did not rate as required for entry into job training that college-entry panelists rated as required.

The results from this criterion-based judgmental standard setting study do not support using NAEP to make judgments about the academic preparedness of 12<sup>th</sup> grade students to enter job training. Job-training panelists identified many NAEP 12<sup>th</sup> grade items they deemed as not required for determining academic preparedness for their job training programs.

In addition, the data collected from the job-training and college-entry panelists do not support the conclusion that minimal academic preparedness for college is the same as minimal academic preparedness for training programs for the five exemplar occupations that were examined. This research indicated the need to determine the prerequisite knowledge, skills, and abilities in reading and mathematics to qualify for placement into entry-level credit-bearing college courses and for job training programs, which led to the course content analyses.

## Course Content Analyses

The *Job Training Programs Curriculum Study* examined course materials from job training programs for the five exemplar occupations. The study objectives were to identify the knowledge, skills, and abilities (KSAs) that are prerequisite and then to compare these prerequisite KSAs with NAEP frameworks and items and with the KSAs identified in the judgmental standard setting study. The major findings from this study were:

### Mathematics

- The job training programs studied have few prerequisite expectations represented in the Grade 12 NAEP Mathematics Framework. The largest number of prerequisites across all occupational training programs are found in the number properties and operations domain, specifically: the systems of measurement; variables, expressions, and operations; and equations and inequalities standards.
- The portions of the NAEP mathematics KSA statements that were identified as inapplicable or excluded from the training course content prerequisites, eliminated much of the complex mathematics knowledge and skills that differentiate the grades 8 and 12 frameworks. As a result, some prerequisite KSAs appear to be better described by the grade 8 objectives.
- Many NAEP items at grade 12 were deemed not required for determining academic preparedness for job training programs. Between 64% and 78% of the 130 mathematics objectives were not evident as prerequisite in any course within the five occupations.

### Reading

- Across all job training programs, the only grade 12 NAEP reading objectives identified as prerequisites for entry-level courses in all five occupational areas were those related to reading informational texts. Specific reading skills that are prerequisite to all five job training programs include locate or recall causal relations and locate or recall organizing structures of texts, such as comparison/contrast, problem/solution, enumeration, etc.
- The number of reading objectives not evident as prerequisite in any course within the five occupations ranged between 16% and 68% of the 37 objectives.

### Mathematics and Reading

- The job-training course prerequisite knowledge, skills, and abilities identified are largely included in the Grade 12 NAEP Frameworks, but the full content of NAEP frameworks is much larger and broader.

The results from the course content analyses do not support using NAEP to make judgments about the academic preparedness of U.S. 12<sup>th</sup> grade students to enter job training. The NAEP 12<sup>th</sup> grade frameworks include much more knowledge, skills, and abilities than the job-training course prerequisite knowledge, skills, and abilities.

## V. Summary of Findings

After this groundbreaking effort to explore if NAEP could report on preparedness for job training, the Governing Board asked, “What overall conclusions can be made about the NAEP Reading and Mathematics at Grade 12 serving as an indicator of academic preparedness for job training?” Several clear themes emerged from the research studies.

### **NAEP’s content coverage is broader than the content covered in job training contexts.**

The content alignment study of NAEP and the WorkKeys assessment found that the NAEP items do not adequately represent the WorkKeys content domain. The comparison of NAEP to relevant training performance requirements for each of the five exemplar occupations found the range of reading and mathematics skills required by NAEP (both grade 8 and grade 12) is broader than the range of reading and mathematics skills required by job training. In addition, the levels of knowledge, skills, and abilities (KSAs) required for NAEP were higher than the levels of KSAs required for entry into job training. The job-training panelists in the judgmental standard setting agreed that less than half of the NAEP mathematics and reading content was relevant to preparedness for their programs. Finally, the analysis of job-training course content found that the NAEP frameworks are much larger and deeper than the prerequisite KSAs for job-training.

### **Across occupational fields, there is disagreement on which content is important for job training preparedness.**

In mathematics, the five exemplar occupations aligned on the importance of number properties and operations followed by measurement. The occupational areas had much less agreement on the other areas of mathematics. In reading, the five exemplar occupations agreed on the importance of understanding vocabulary, identifying important information, summarizing, integrating information within/across texts, drawing conclusions, and applying information to new contexts. Beyond these skills, there was little or no agreement on other skills such as analyzing information, interpreting text, or providing evidence to support an interpretation.

### **Within an occupational field, there is disagreement on which content is important for job training preparedness.**

Even in occupational fields that have a more common core of training, such as automotive master technicians and LPNs, there is still not agreement on the required content to be prepared for job training. The discrepancies are even greater in fields where there is less of a common core of training (computer support specialists, pharmacy technicians).

**A NAEP job training preparedness indicator for the NAEP reading and math assessments is unlikely at this time.** Part of the purpose in conducting multiple research studies using multiple methods was to determine if there was mutually confirming evidence. The Governing Board's interest was whether, when examining these research results in their totality there was: (1) convergence across the two academic preparedness areas (college and job training), or (2) convergence within each academic preparedness area.

First, based on the results and summary above, it is clear that there are wide differences in the required knowledge, skills, and abilities for entry into job training as measured on a standardized measure of job skills, an analysis of relevant job skills, judgment by occupational experts, and analysis of job-training course content as compared to the NAEP frameworks and

assessments, which are much wider and deeper. The results indicate no definitive evidence that the academic qualifications needed for job training preparedness and the academic qualifications needed for college preparedness are the same; that is, *there is, to date, no convergence across the two academic preparedness areas.*

Second, with regard to the convergence of evidence within each academic area, *to date, convergence has emerged only for using 12<sup>th</sup> grade NAEP as an indicator of academic preparedness for college* (see [\*Towards The National Assessment of Educational Progress \(NAEP\) as an Indicator of Academic Preparedness for College and Job Training\*](#)). Given the evidence compiled to date for academic preparedness for job training, it is unlikely that NAEP will be able to report an indicator for job training academic preparedness for the NAEP mathematics or reading assessments.

## VI. Conclusion

The Governing Board began a journey over ten years ago to answer the question of, “Can NAEP Reading and Mathematics at Grade 12 serve as an indicator of academic preparedness for college and job training?” As a part of that question, the Governing Board also sought to find out if NAEP might provide (1) a single indicator of academic preparedness across college and job training, or (2) separate indicators of academic preparedness for college and for job training. Based on more than 30 studies conducted at the direction of the Governing Board answers to this question are emerging.

The evidence to date indicates that 12<sup>th</sup> grade NAEP *can arguably* serve as an indicator of academic preparedness for college. The evidence to date *does not* support using at grade NAEP as an indicator of academic preparedness for job training. An important benefit of this research is the confirming evidence across research studies that there are wide differences in the required knowledge, skills, and abilities for entry into job training as compared to the required knowledge, skills, and abilities for entry into college.

**What is next?** Although the research findings to date have not supported the establishment of a NAEP academic preparedness for job training indicator, the lessons learned from this research can inform possible future research. Using a subset of the content covered by the grade 12 NAEP as a measure of academic preparedness for job training might be explored. Agreements with partners such as employers, the U.S. Department of Labor, or others may provide the data for statistical linking or benchmarking studies that have not been possible to date.

The Governing Board will consider the lessons learned from this research as they determine the next phases of the academic preparedness research.

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## **Participant Engagement in NAEP: Critical Review and Synthesis of Research**

### **Background**

Preceding the 2014 release of the first set of NAEP student performance results relative to academic preparedness for college, the Governing Board conducted a series of outreach activities, including desk side briefings with policy leaders and organizations about the results of the Governing Board's academic preparedness research. In these desk side briefings, a question arose on whether grade 12 students are motivated to put a strong effort into taking NAEP. Some people find it difficult to believe that 12th-graders show their best efforts on a test that does not count.

There is some evidence that 12<sup>th</sup> grade students do take the NAEP test seriously, when reviewing completion rates and completion of open-ended questions in particular. The March 2014 COSDAM meeting included a briefing with some encouraging data on grade 12 school and student participation rates and item response rates (from 1992 to 2013) and comparisons to grades 4 and 8. A 'Focus on NAEP' report, addressing grade 12 participation and engagement in NAEP, is scheduled to be released by NCES in January 2016.

Previous COSDAM discussions have noted that the secondary research on NAEP and motivation often cited has not been critiqued for technical merit, and consequently, in November 2014, COSDAM considered that a literature review and critique of existing studies could be performed as part of the efforts on preparedness research, with the following objectives:

- To critically evaluate the claims that have been made;
- To summarize the extent to which results are consistent across studies; and
- To recommend future research that could be performed.

In June 2015, the Governing Board issued a request for proposals, and in September 2015, a contract award was made to begin this work.

### **Contract Award for the Project**

In September 2015, AnLar Incorporated, along with its subcontractors, Abt Associates and Minds Incorporated, were awarded a contract to conduct a systematic literature review documented via annotated bibliography and synthesis summary, addressing what the field knows about the extent to which sub-optimal engagement may affect NAEP student performance and NAEP test administration.

## **Project Team**

Dr. Tate Gould and Ariel Jacobs of AnLar serve as co-Project Directors, and each has extensive experience relevant to literature reviews in assessment and education contexts. Technical expertise is represented via Dr. Joseph Taylor of Abt Associates and Dr. Laura Feagans Gould of Minds Incorporated, who both serve as Principal Researchers for the project.

## **Project Milestones**

A kick-off meeting for the project was held October 13, 2015, and a methodology meeting for the project was held on November 2, 2015. Both of these meetings will help the AnLar team develop the design document and final project plan to be submitted by early December 2015.

Other key project milestones include identifying extant research and compiling an annotated bibliography that includes a critical evaluation of methods, claims, findings, and conclusions, in terms of rigor, inferences and evidentiary support, as well as connections and relevance to other assessments. Part of the scope of work for this project includes an analysis of how student motivation issues on NAEP relate to other assessment programs, in terms of stakes, item types, and mode of test administration. Overall, the project's literature review is to address all grades and subjects in which NAEP is administered, as well as digital-based test administration.

Research that meets a priori criteria, outlined in the design document, will be summarized in a comprehensive synthesis report on findings, presenting overall conclusions most relevant to NAEP, while noting and explaining points of agreement and disagreement, and considering recommendations for future research. This work is to be accomplished across four project tasks:

- Task 1*     Project Management**
- Task 2*     List of Relevant Research**
- Task 3*     Bibliography and Technical Review**
- Task 4*     Synthesis Report**

Results from this project are scheduled to be presented at the August 2016 Board meeting. COSDAM will receive ongoing updates as the work progresses.