

Technology and Engineering Literacy (TEL) Assessment

Overview and Discussion

At the December 2013 Board meeting, members requested a plenary session briefing on the NAEP Technology and Engineering Literacy (TEL) Framework and Assessment. An open-session briefing has been scheduled for Friday, February 28 at 3:45 p.m. The Assessment Development Committee (ADC) Vice Chair, Cary Sneider will be joined by William Ward of NCES and Lonnie Smith of ETS to share information on TEL and facilitate a full-Board discussion.

A closed session TEL briefing was held at the December 2012 Board meeting. Much has occurred since that time, including completion of item development and review; the TEL pilot test in 2013; and the grade 8 operational TEL assessment this winter—January through March, 2014. The Board and NCES have worked collaboratively to post a number of multi-media materials on the web, including a TEL released task, to inform NAEP audiences about this innovative assessment.

Two brief documents are included on the following pages: a TEL overview and an essay by former ADC Chair, Alan Friedman. In addition, we are providing some links to TEL web-based resources:

- Interactive TEL Framework

<http://www.nagb.org/publications/frameworks/technology/2014-technology-framework/toc.html>

- PDF version of the TEL Framework

http://www.nagb.org/content/nagb/assets/documents/publications/frameworks/naep_tel_framework_2014.pdf

- Alan Friedman's TEL video

<http://www.youtube.com/watch?v=N3ZrK76wez4>

- NCES TEL video, sample TEL task, and related information

<http://nces.ed.gov/nationsreportcard/tel/>

NAEP Technology and Engineering Literacy (TEL) Overview

Why assess TEL?

- TEL content and skills are important for ALL students to function effectively in a technology-driven society, not just for students pursuing STEM-related careers.
- The National Academy of Engineering and the National Academy of Sciences recommended in 2006 that the Governing Board develop a Framework for a NAEP assessment in technology and engineering literacy. The Board collaborated with many prominent organizations to envision and develop the TEL Framework.
- Business leaders, policy makers, and others are very interested in measuring and reporting on 21st century skills such as collaboration, which are measured by TEL.
- NAEP can provide models for assessing these challenging content and cognitive skills in a dynamic, computer-based environment—areas that cannot be measured via paper and pencil.
- TEL measures the T and E in STEM, to augment NAEP science (S) and math (M) assessments. It is unlikely states will embark on assessments in TEL because they do not typically require instruction (courses) in these areas. Therefore, a national measure of achievement and progress in TEL is the only viable option for knowing how the nation is doing.
- TEL could provide links to national and international standards and assessments. For example, the Next Generation Science Standards include technology and engineering literacy content. In addition, PISA measures problem solving and applications in real-world settings.

“There's just an absence of knowledge, and with absence of knowledge there's an absence of conversation and an absence of action. So I think this is just fantastic. And the more [the Board] is expanding into other areas, and again, just telling the truth... [TEL] will be a baseline and it will be a depiction of reality and we desperately need that.”

Secretary Arne Duncan, Governing Board Meeting, December 2011

How was the TEL Framework developed?

- Comprehensive, deliberative 18-month process via Governing Board contract with WestEd.
- Broad-based project committees involving major technology, engineering, science, and business groups; teachers, curriculum and assessment experts, policymakers, and others.
- Project committee members from NASA, Google, IBM, Intel, National Academy of Engineering, National Science Foundation, International Society for Technology in Education (ISTE), Society of Women Engineers, State Educational Technology Directors Association (SETDA), and others.
- Review by thousands of individuals via regional forums, webinars, and online comments from all arenas of technology and engineering, as well as business leaders and the general public.
- Monitoring and guidance by the Governing Board throughout the process;
- Unanimous adoption by the Board in March 2010.
- The entire TEL process will encompass more than eight years of work – from Framework development to TEL reporting.

TEL and the Future of NAEP

The National Assessment of Educational Progress (NAEP) Schedule of Assessments is a concise expression of the Board's policies and priorities. So it is appropriate, even obligatory, for NAGB to revisit its Schedule of Assessments regularly, and especially when there is a change in the budget in the offing.

For the current discussions about the Schedule of Assessments, this note argues that the new TEL 2014 8th grade assessment, the planned expansion of TEL to 4th and 12th grades, and the inclusion of TEL in the regular assessment rotation going forward, should be very high priorities for NAGB. These assessments are important for the future of NAGB and NAEP not only because of the high value and timeliness of the new information TEL will give the nation, but because TEL is the best opportunity the Board has at present for expanding the constituency for NAEP and for enhancing the standing of NAEP in the minds of the US public, education policy makers, and government. This opportunity comes because NAGB was ahead of most education sector participants in recognizing the growing importance of students' capabilities in *technology and engineering*, not only in basic science and math, for the future of the United States.

Attention to science, technology, engineering and math (STEM) has been growing in all sectors of US discourse since Sputnik was launched in October 1957. This interest and concern in STEM education has not flagged since, and it has periodically been spurred by local and world events, such as the rise of China as a technology manufacturing powerhouse, the engineering of the world's largest scientific instrument in Europe (resulting in the discovery of the Higgs boson and a Nobel Prize this year), and the regular recurrence of young tech wizards, without even a college degree, who become overnight multi-millionaires.

NAGB's new science framework came out in 2009, and at that time work was well underway on what became TEL. Both projects were known to the National Research Council in 2011 when it produced its well-received study *A Framework for K-12 Science Education*, which called for a sweeping upgrading of K-12 science education, including the elevation of engineering to a priority comparable to that previously accorded only to science. In 2013 a 26-state consortium released the *Next Generation Science Standards (NGSS)*, based on the NRC's *Framework*, and including the new priority to engineering and technology. Nearly all of the new aspects of science, technology, and engineering called for in these standards were already incorporated in NAGB's science and TEL assessment frameworks, and indeed the existence of the NAGB assessment frameworks encouraged both the NRC and the states' consortium in their work.

So there is now a new peak of interest in what U.S. students presently know and can do in technology and engineering, as well as in science and math. The NGSS are being adopted by many states, and other calls for attention to student performance in technology and engineering are coming from reports like the Harvard School of Education's *Pathways to Prosperity*, which are being converted into programs in many states. As these initiatives take hold, understanding the baseline STEM performance of US students, and tracking how that performance changes over the next decade and beyond will be key parts of US educational progress. No assessments except NAEP's science and TEL are available to provide this information in a way so consistent with the new standards.

But there is another case for TEL as well: what TEL will do for the image of NAEP in the minds of the public, the White House, the Congress, and education policy makers. Of all the things we are doing right now, it is TEL which is in the best position to demonstrate the continuing relevance and foresight of the NAGB's structure and the capability of the Department of Education to deliver critical information just when it is most needed. The release of TEL data in 2015 can thus build support for all of the NAEP enterprise, just when that support might start to flag as the Common Core Assessments (which do not cover science, technology, or engineering) capture more of the public's attention. Work on the creation of a separate NGSS assessment is just starting now, and that assessment will remain far behind NAEP's science and TEL assessments for years to come. Expansion of TEL to 4th and 12th grades in the coming years will give TEL a second wind as a force for demonstrating NAEP's continuing relevance to the US education enterprise.

So beyond the inherent timeliness of the TEL assessment findings, TEL comes just at the right time to demonstrate the value and encourage support for the continued robust infrastructure behind The Nation's Report Card. Shakespeare's admonition about the timing of initiative seems relevant here:

There is a tide in the affairs of men.
Which, taken at the flood, leads on to fortune;
Omitted, all the voyage of their life
Is bound in shallows and in miseries.
On such a full sea are we now afloat,
And we must take the current when it serves,
Or lose our ventures.

[*Julius Caesar Act 4, scene 3, 218–224*](#)

Alan J. Friedman
December 8, 2013