Technology and Engineering Literacy: Not Left to Chance

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CSL Administrators Strand

Johnny J Moye, Ph.D., DTE
William E. Dugger, Jr., Ph.D., DTE
Purpose/Progression of Presentation

• Change the Equation – Vital Signs Document
• Identify and show a correlation between
  • NAEP-TEL Assessment Questions
  • National standards (STL and NGSS), and
  • Learn Better by Doing Study results
• Recap, Call to Action
CTEq’s coalition of members are working toward universal STEM literacy by advocating for state policies and practices that are known to produce STEM-literate high school graduates; ensuring high standards for all students; and supporting evidence-based high quality STEM learning programs. 

www.changetheequation.org
Report analyzes results of the 2014 8th grade NAEP-TEL Assessment

Over 21,000 students – 840 U.S. schools

We will answer specific questions posed in this report
“U.S. Middle Schoolers Lack in-Depth Experience With Technology and Engineering.”

“Well less than half the nation’s eighth-graders are on track to become proficient in a set of skills they will need to thrive in society and the workplace.”

“American youth spend precious little time tinkering, troubleshooting, or doing the kinds of hands-on problem-solving that are at the heart of technology and engineering.”
“Do students have the opportunity to brainstorm designs in an iterative fashion to address a specific challenge?”

“Do students build models to solve a problem?”

“Do students ever have to design something with limited time or resources?”
NAEP-TEL Assessment -Framework

+ National Assessment of Educational Progress – Technology and Engineering Literacy Assessment (NAEP-TEL)

+ Measures whether students are able to apply technology and engineering skills to real-life situations.
National Standards

- Standards for Technological Literacy (STL)
- Next Generation Science Standards (NGSS)
The purpose of this study is to determine the extent to which U.S. public school elementary and secondary education science, technology, engineering, and mathematics (STEM) students are doing hands-on activities in their classrooms.
Documents Used in the Study

- Change The Equation Questions
- NAEP-TEL Iguana Home Questions/Tasks
  - Four exemplar tasks available
- Standards (STL & NGSS)
- Learn Better by Doing Study Results
CTEq Question 1:
Do students have the opportunity to brainstorm designs in an iterative fashion to address a specific challenge?

NAEP-TEL Iguana Home Task: Students are to evaluate/reevaluate the cage design by considering design solutions and make predictions for solving the problem of Iggy’s cage being too cold.
Scenario 1 (Cont.)

Standards Addressed:

**STL 11K**: Test and evaluate the design in relation to pre-established requirements, such as criteria and constraints, and refine as needed.

**NGSS MS-ETS1-4**: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
Scenario 1 (Cont.)

Learn Better by Doing Result:

My students have developed a solution to be tested and then modified it on the basis of the test results.

Technology and Engineering “Yes”: 89.2%

Science “Yes”: 70.2%
Scenario 2

CTEq Question 2:
Do students build models to solve a problem?

NAEP-TEL Iguana Home Task:
Test the cage design and evaluate alternative solutions.
Scenario 2 (Cont.)

Standards Addressed:

**STL-13F:** Design and use instruments to gather data.

**NGSS: MS ETS1-1** Define a design problem that can be solved through the development of an object, tool, process, or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.
Learn Better by Doing Result:

My students have made a model to test for solutions to a problem.

Technology and Engineering “Yes” 86.2%

Science “Yes” 65.4%
Scenario 3

CTEq Question 3:
Do students ever have to design something with limited time or resources?

NAEP-TEL Iguana Home Task:
Redesigning the cage to prevent dehydration.
Standards Addressed:

**STL-13F**: Design and use instruments to gather data.

**NGSS: MS ETS1-1**: Define a design problem that can be solved through the development of an object, tool, process, or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.
Scenario 3 (Cont.)

Learn Better by Doing Result:

My students have tested and evaluated a design in relation to pre-established requirements.

Technology and Engineering “Yes”: 90.9%

Science “Yes”: 70.5%
Change the Equation Questions - Learning Better by Doing Study Teacher Responses

Do students have the opportunity to brainstorm designs in an iterative fashion to address a specific challenge?

Do students build models to solve a problem?

Do students ever have to design something with limited time or resources?
Technology and engineering lessons and activities are occurring in U.S. public schools. Occurring more frequently in Technology and Engineering courses than in Science courses.
Nationally recognized publication states that “U.S. Middle Schoolers Lack in-Depth Experience With Technology and Engineering.”

This statement may be true but – there is an answer to that concern.
Recap (Cont.)

Data show that students DO have the opportunity to brainstorm designs in an iterative fashion to address specific challenges.
Recap (Cont.)

Data show that students DO build models to solve problems and that they design things with limited time and resources.
So What Does All This Mean?

- Technology and engineering instruction and activities are occurring more frequently than national leaders think.

- This instruction occurs in science, but more frequently in technology and engineering classrooms.

- Education leaders (national, state, division) may not fully understand and utilize technology and engineering programs.
Call to Action

Communicate with education leaders:

+ Technology and engineering instruction, activities, and assessments in classrooms
+ Students gain the knowledge to “become proficient in a set of skills they will need to thrive in society and the workplace”
+ Technology and engineering students do tinker, troubleshoot and do “the kinds of hands-on problem-solving that are at the heart of technology and engineering.”
Resources


Thank You!

+ Thank you for your attention

CONTACT INFO:  jmoye@iteea.org  wedugger@iteea.org