

REVISION OF THE STANDARDS FOR TECHNOLOGICAL LITERACY

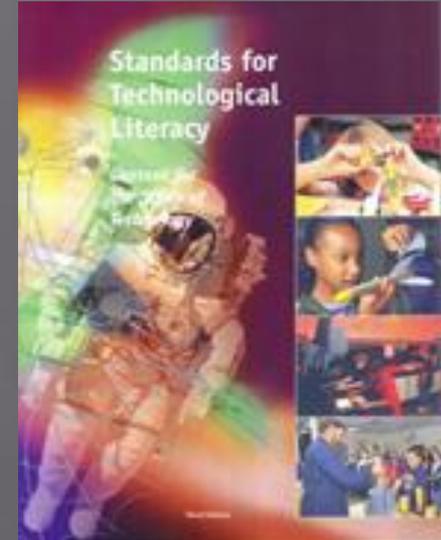
A Joint Project by ITEEA and CTETE

Funded by the National Science Foundation
ATE Conference Grant #1904261

Are the Standards still current?

- *Standards for Technological Literacy* (STL) was developed in the late 1990s and published in 2000.
- Technological innovations and advancements in curriculum and instruction (i.e. stronger connections to engineering and integrative STEM education) necessitated the revision of STL.
- Shift to inclusion of engineering in 2010 and ITEA Name Change to ITEEA
- Engineering Design added to Next Generation Science Standards in 2013.
- Current proposals to add computational literacy and coding to field.
- Robotics content very popular in Technology and Engineering classrooms.
- Field asked to help prepare students for college and career readiness through academic content.
- Field asked to teach critical thinking and 21st Century Skills.
- With all this, how are the 2000 STLs holding up?

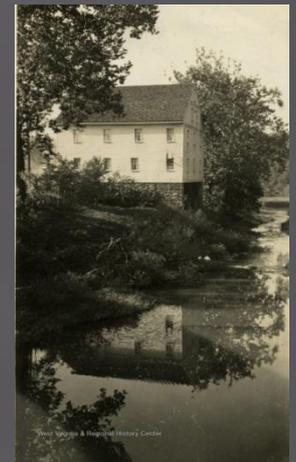
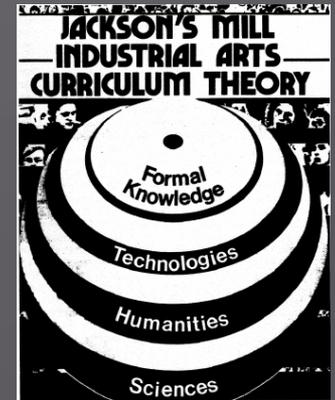
Context



- ▣ *Standards for Technological Literacy* released by ITEA in 2000.
- ▣ Minor updates to STL occurred in 2002 and 2007.
- ▣ Relatively unchanged the last 19 years.
- ▣ State departments of education moving away from these “out of date” standards. Is Praxis II teacher certification exam next?
- ▣ New content and ideas in field: engineering, computational thinking, STEM since 2000.
- ▣ Change process envisioned as a second Jackson’s Mill.

1980 Jackson's Mill

- Jackson's Mill Industrial Arts Curriculum Theory Project Theory Project at Jackson's Mill, W.V.
- Directed by James Hales, West Virginia Department of Education and James Snyder, Director of Technology at Fairmont State College.
- Funded by American Technical Society
- Convened 21 Industrial Arts leaders to change focus of field from career education to technology.
- Significant event in history of field, most cited research resource in 1980's and the 1985 change from AIAA to ITEA is directly linked to Jackson's Mill.
- Importance to current effort is in the rich discussion expected, not describing the content areas.



Calls for Updating

- ▣ 2011 and 2012 ITEEA, ASEE, NAE and BSCS initiated revision grants but were turned down by NSF.
- ▣ Technology & Engineering Teacher special issues:
 - *Who Are We?* December/January 2017
 - *Computational Literacy* December/January 2018
 - *Standards for Technological Literacy* April 2018
- ▣ Council on Technology & Engineering Teacher Education (CTETE) Executive Board - Summer 2018 Priority



Broad Overview

1. Develop valid process of revision
2. Solicit feedback
3. Develop information and resources
4. Apply for funding
5. Taskforce work
6. Goal is to publish *Standards for Technological and Engineering Literacy* in 2020

1. Develop Valid Process

- ▣ CTETE Executive Board worked on idea of the revision process of survey, leaders, reviewers and task work.
- ▣ ITEEA leaders became involved in later drafts of survey, process, and leader team nominees.
- ▣ Timeline approved by this development team.
- ▣ Eight revision leaders selected to represent two from CTETE board, ITEEA President and Senior Fellow, STEM CTL Director, Elementary STEM Council, and several professors with technological literacy and engineering backgrounds.

Leader Team

- ▣ Dr. Tom Loveland, Chair and PI. Univ Maryland ES
- ▣ Dr. Marie Hoepfl, Co-PI, Appalachian State Univ
- ▣ Dr. Todd Kelley, Purdue University
- ▣ Dr. Michael Daugherty, University of Arkansas
- ▣ Dr. Jenny Buelin, ITEEA STEM Center
- ▣ Dr. Charlotte Holter, ITEEA Elementary STEM
- ▣ Dr. Johnny Moye, ITEEA Senior Fellow
- ▣ Anna Sumner, former ITEEA President

- ▣ Steve Barbato, Co-PI, Executive Director ITEEA

Process

- ▣ Mix of 30 Reviewers listed in NSF application:
 - Five classroom teachers (1 ELED, 2 MS, 2 HS)
 - Two district or state supervisors
 - A representative from ASEE, NSTA and NCTM each.
 - 14 university professors (technology, engineering, STEM)
 - Three two-year college faculty (same at pre-service level)
 - Three industry representatives (Information Technology, Renewable Energy, and Manufacturing/Robotics)
- ▣ Demographics: A balance of gender, geography, ethnicity, and age
- ▣ Personal Attributes: Good thinker, good writer and task completer

Process

- ▣ Thirty reviewers obtained by modified Delphi method. Eight reviewers identify and rank order five potential reviewers.
- ▣ At ITEEA, this pool of 40 reduced to 16.
- ▣ Identified and ranked two more reviewers. These 32 were reduced to 8-10.
- ▣ Final slots by leader team to fill gaps in NSF approved categories.
- ▣ Planning meetings via Collaborate and at ITEEA prior to August work session.

Chinsegut Reviewer Writers

Dr. Scott Bartholomew Purdue University	4 YR Prof
Dr. Sharon Brusic Millersville University	4 YR Prof
Dr. Vinson Carter University of Arkansas	4 YR Prof
Dr. Cameron Denson North Carolina State University	4 YR Prof
Dr. Andrew Hughes California State University- San Bernardino	4 YR Prof
Dr. Tyler Love Penn State	4 YR Prof
Dr. Chris Merrill Illinois State University	4 YR Prof
Dr. Derrick Nero University of Nebraska Omaha	4 YR Prof
Dr. Phillip Reed Old Dominion University	4 YR Prof
Dr. Thomas Roberts Bowling Green State University	4 YR Prof
Dr. Steve Shumway Brigham Young University	4 YR Prof
Dr. Thomas Siller Colorado State University	4 YR Prof
Dr. Scott Warner Millersville University	4 YR Prof
Dr. John Williams Curtin University, Perth, AU	4 YR Prof
Michael Cermak Rockford Public Schools	2 YR Prof

Dr. Taylor Kidd Community College of Baltimore County	2 YR Prof
Dr. Geoff Knowles Ivy Tech Community College	2 YR Prof
Kenyatta Lewis-White Prince Georges Public Schools	Supervisor
Steve Parrott Illinois State Dept of Education	Supervisor
Julie Sicks Panus Plymouth Elementary (NH)	Elementary Teacher
Scott Jewell Ipswich Middle School (MA)	MS Teacher
Rachel Kane West Harford Schools (CT)	MS Teacher
Nancye Hart ITEEA EbD STEM (VA)	HS Teacher
Jocelyn Long Downingtown STEM Academy PA	HS Teacher
Dr. Bradley Bowen - ASEE Virginia Tech	ASEE Rep
Patricia Simmons NSTA Special Initiatives	NSTA Rep
Dr. Trena Wilkerson Baylor University	NCTM Rep
Dr. Susan Bastion Cisco Systems	IT Industry Rep
Brandon Hamby Stihl Inc	Manufac Rep
Robi Robichaud World Resources Institute	Renewable Energy Rep

2. Solicit feedback

- ▣ Develop ITEEA survey for November 2018 to capture views of university professors, classroom teachers and district or state supervisors on the need for revision.
- ▣ Presentation to 21st Century Leaders
- ▣ Solicit ideas from attendees at 2019 ITEEA.
- ▣ Presentations at ITEEA.
- ▣ ITEEA Website and news releases
- ▣ Engage in discussions with leaders in the field

3. Develop Information and Resources

- ▣ Other standards collected to be shared (NGSS, CCSS, ISTE, NAEP TEL, CSTA).
- ▣ Comments in ITEEA survey and at ITEEA collated into specific STL binders for review team
- ▣ Data collection from Fall 2018 ITEEA survey to members and stakeholders.
- ▣ Initial results from survey published in *Technology and Engineering Teacher* in May June 2019 issue.

4. Apply for Funding

- ▣ October 2018: Team applied for \$77,000 Advanced Technological Education (ATE) Conference Grant from NSF.
- ▣ Government shutdown impact on funding.
- ▣ February 2019: Responded to reviewers query.
- ▣ Approved grant paid for location (Chinsegut Hill Retreat in Brooksville, FL), meals, travel for 40 and stipends.
- ▣ Additional funding may be applied for in the future for website publishing, follow-up work on the addendum books.

Taskforce Summer 2019

- ❑ Chinsegut Hill Retreat, Brooksville, Florida August 4th – 8th.
- ❑ Leaders arrived 8/4/2019
- ❑ Reviewers on 8/5/2019



Yes, it was
air-conditioned.

5. Taskforce work

- ▣ August 4th Leaders convened. Reviewers 5th – 8th
- ▣ Small and whole group discussions throughout
- ▣ Presentations about rationale, contexts and future technologies.
- ▣ Writing teams worked on updating specific standards or writing new standards.
- ▣ Leaders mentored the review teams.
- ▣ Individuals then reviewed work of other teams.
- ▣ Presentations on last morning.

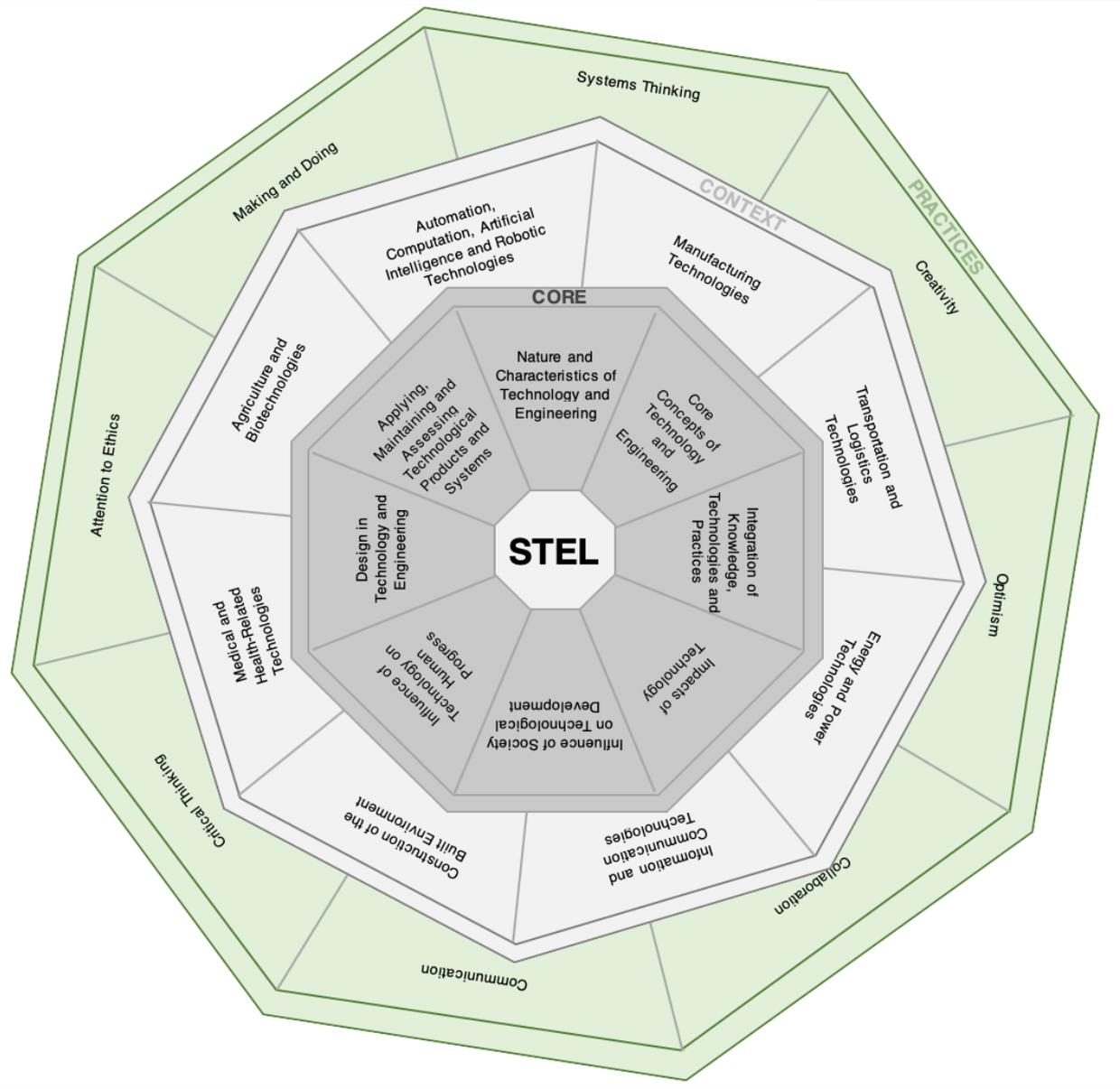
At Chinsegut



The Intended Project Outcome

- ▣ Updated standards for the field that will be accepted and used by states, curriculum developers, certification exam developers, university professors and classroom teachers for the foreseeable future.
- ▣ The name changed to *Standards for Technological and Engineering Literacy: Defining the Role of Technology and Engineering in STEM Education*.
- ▣ The number of standards was cut from 20 to 8.
- ▣ The number of benchmarks dropped 288 to 155.
- ▣ The technologies in our field always change and so there will be a continual need to revise these standards.

New Vision of STEL



STEL Key Points

- ▣ Eight disciplinary core standards and 155 benchmarks should be taught in education but are best learned in technology and engineering classrooms.
- ▣ Eight technology and engineering contexts are where the core disciplinary standards should be taught.
- ▣ Eight Technology and Engineering Practices are the key attributes and personal qualities the T & E graduates should exhibit.

Core Disciplinary Standards

1. Nature and Characteristics of Technology and Engineering
2. Core Concepts of Technology and Engineering
3. Integration of Knowledge, Technologies and Practices
4. Impacts of Technology
5. Influence of Society on Technological Development
6. Influence of Technology on Human Progress
7. Design in Technology and Engineering
8. Applying, Maintaining and Assessing Technological Products and Systems

Technology and Engineering Contexts

1. Automation, Computation, Artificial Intelligence and Robotic Technologies
2. Manufacturing Technologies
3. Transportation and Logistics Technologies
4. Energy and Power Technologies
5. Information and Communication Technologies
6. Construction of the Built Environment
7. Medical and Health-Related Technologies
8. Agriculture and Biotechnologies

Technology and Engineering Practices

1. Systems Thinking
2. Creativity
3. Optimism
4. Collaboration
5. Communication
6. Critical Thinking
7. Attention to Ethics
8. Making and Doing



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Post Taskforce

- ▣ Drafts of revised standards shared with ITEEA members, other professional associations, councils in ITEEA during Fall 2019.
- ▣ Final version written in January-February 2020.
- ▣ Revised standards released in 2020.
- ▣ Future funded work could include development of interactive website, providing example lesson plans for teachers and/or revising the four addendum books.

Summary

- ▣ The STLs needed to be revised but by how much?
- ▣ 2002 & 2007 little change
- ▣ \$77,000 NSF grant not equivalent to original STL grant so no four year process envisioned.
- ▣ Looking for middle ground to update standards and account for changes in the field and new technologies.
- ▣ *Standards for Technological and Engineering Literacy* 2020 to provide accreditation, curriculum developers and stakeholders the core content, contexts and practices necessary to produce technology and engineering literate students.