



FAQs: Standards for Technological and Engineering Literacy (STEL)

1. What is the overall rationale and mission for the standards revision project?

When published nearly two decades ago, Standards for Technological Literacy (STL) established content guidelines and benchmarks for learning across the K-12 spectrum. However, the technological world and the knowledge required to be productive in it continue to evolve. A number of the specific examples provided in the document have become obsolete, and the dated quality of some of the material in STL threatens to lead educators to abandon this framework. The International Technology and Engineering Educators Association (ITEEA) and the Council on Technology and Engineering Teacher Education (CTETE) are working together on this needed revision.

2. What is the scope of the revision?

The universals of technology have changed since STL was published in 2000. The 2006 [Rationale and Structure](#) document and relevant literature published since STL was released were used to inform the current revision project. This update includes reducing the number of standards and benchmarks and adding new content such as crosscutting concepts to mirror the practices of contemporary standards developed for other disciplines.

3. As written, STEL seems to be about technological and engineering literacy. Does this mean that engineering is now considered subsumed by technology, or are you talking about two different sets of standards, one for technology and one for engineering?

STEL positions technological and engineering literacy as a combined literacy of technology and engineering. As presented in STEL, selected processes and habits of mind used in engineering serve as key components of this literacy, which is distinguished from the more explicit job/career orientation that would be found in advanced study of engineering. STEL refers to the former as “little e engineering,” and the latter as “big E Engineering” as a means of differentiating the two approaches.

4. Can you explain to me what you mean by engineering as a verb?

STEL does not attempt to encompass the full spectrum of engineering content. Technological and engineering literacy, with its emphasis on technological products, design, and technology/society interactions, affords a broader base than would a more exclusive focus on engineering and its content subfields (e.g., mechanical, civil, electrical, and so on). Another way this relationship has been expressed is by referring to the disciplinary study of engineering as a noun (Engineering), and the use of engineering design and application of engineering habits of mind as a verb (engineering). This latter characterization is used in these standards. In this formulation, technology provides the base for the STEL document while engineering (as a verb) brings in the key ideas and selected engineering practices and habits of mind that provide critical linkages within STEM and the broader educational environment.

5. STEL includes the subtitle *Defining the Role of Technology and Engineering in STEM Education*. STEM is not a disciplinary area or subject in education; it is four different content areas that could be integrated, but often are not. Are you claiming that the STEL benchmarks are STEM standards?

No. STEM, in the best scenario in education, describes the integration of mathematics, science, technology, and engineering as a holistic way to teach these content areas to students. Mathematics, science, and technology and engineering are separate content areas typically taught by separate teachers. However, by integrating lessons within a STEM-based framework, students become better prepared for their future college and career plans. The STEL subtitle means what it says: technology and engineering have an equal role to play in STEM as science and mathematics. In addition, there are proposed STEAM frameworks that include the arts, social studies, and language arts. In many technology and engineering projects, there are direct connections to all of these disciplinary content areas.

6. The previous standards (STL) included a section titled “The Designed World,” which defined standards and benchmarks related to the traditional courses often taught in technology and engineering education programs. Why did you take those away? Are our courses now being thrown out? What does it mean that they are now called “Contexts?”

The Designed World standards in STL were linked to the traditional courses of construction, manufacturing, transportation, communication, energy and power, medical technology, and agriculture and related biotechnologies. Some of these were handed down from the industrial arts era and are familiar to many technology education teachers across the United States and beyond. In a 2004 article by Loepp¹ the author states that educators from the technology

¹ Loepp, F. (2004). Standards: Mathematics and science compared to technological literacy. *The Journal of Technology Studies*, 30(1/2), 2-10.

discipline wanted 200 plus specific benchmarks but the technology advisory committee advised a shorter, more manageable number. Standards for Technological Literacy was published in 2000 with 288 benchmarks.

*Although the original November 2018 survey for the STEL project seemed to show support for the original 20 STL standards (with the possible addition of three more designed world standards), the leader team looked closely at scholarly work and trends in other disciplinary standards, all of which advocated for a reduced number of standards. In March 2019, a decision was made to drop the Designed World standards from the core disciplinary standards and organize them as Contexts, since these are the backgrounds in which the core disciplinary standards and technology and engineering practices are taught. **This change means that school districts have the flexibility to teach courses using traditional titles but with the expectation that all technology and engineering courses, regardless of their contextual focus, should teach the core disciplinary standards and technology and engineering practices within them.** In short, this takes the position that the former Designed World standards do not represent core disciplinary standards but rather that they are the settings, units, lessons, and places where the core standards should be taught.*

7. The survey I took in November 2018 seemed to point towards a final set of 20 to 22 standards. Instead, there are now eight. Why did you reduce the number of standards?

See the answer to question #6 to understand why the original Designed World standards 14 - 20 were removed. Of the thirteen remaining original standards, many were found to be overlapping or similar, so they were combined with new titles. For example, there were multiple standards on engineering design, which were combined to form Standard #7 Design in Technology and Engineering Education. The purpose of reducing the standards from 20 to eight and the benchmarks from 288 to 142 was to change from a set of standards that was unrealistically broad to a set of “power” standards teachers can understand and more realistically teach within their given classroom contexts.

8. The previous STLs had benchmarks written as big idea guidelines. The new STEL benchmarks are written with verbs. What was the rationale for making this change, and how does it benefit teachers?

The November 2018 member survey indicated strong support for keeping the standards as guidelines. The eight members of the leader team and the 30 Chinsegut writers expressed a strong preference to include verbs linked to the cognitive, affective, or psychomotor domain in each benchmark. In addition, it was noted that other national standards such as Next Generation Science Standards were written with action verbs. The rationale was that by

providing a verb, teachers and curriculum developers would find it easier to develop assessments for the standards and benchmarks. The full STEL document will include a matrix indicating which taxonomy levels are being met by the benchmarks. This will be helpful to teachers looking for benchmarks at specific levels in the cognitive, affective, and psychomotor domains.

9. In the 2019 [Background, Rationale, and Structure](#) document, you make the case that the benchmarks can be used in areas as diverse as career and technical education and computer science. Aren't you watering down our content areas, back to the Practical Arts of the 1970s?

The STEL standards are envisioned as power standards that all students should be exposed to and internalize to achieve greater success in their lives, whether in college, their career, or personally. In that sense, the standards should be taught everywhere, but we understand that the best place to teach the core standards is in a technology and engineering class with a certified technology and engineering teacher. In many states, technology and engineering education is one of the specialty areas under career and technical education. These models are based on the Carl D. Perkins federal legislation that provides program funding and requires program measures tied to employability. As a result, many state plans target high need areas such as computer science. Other school districts and states teach technology education in more traditional manufacturing modes or classify specialized technical classes (e.g., cybersecurity) as technology education school credits. STEL is designed to be implemented across a wide range of education system models, including internationally.

10. Is the field moving away from the trades and our traditional courses in favor of just technological literacy courses?

Technology and engineering education has always been a broad discipline with many types of programs and courses. In the U.S. programs and courses are developed at the state level, so it would not be appropriate for ITEEA to define the field as only engineering courses or only foundations of technological literacy. For example, there are recently-developed programs in game art design, cybersecurity, and multimedia production that don't fit into the traditional transportation, manufacturing, construction, or communication models. At the same time, many states and countries continue to offer these more traditional courses. For example, in the midwestern United States, many technology and engineering programs are focused on manufacturing and building industrial job skills. There are states where career and technical education is the closest content to technology and engineering education that is offered. The STEL benchmarks, technology and engineering practices, and technology and engineering contexts were written to allow for this variation. The focus should be on inclusion of the standards, practices, and contexts wherever appropriate, not on exclusion simply due to how courses are named.

11. Is STEL written for too many potential courses across the country and world? Shouldn't it just focus on Engineering byDesign™ courses?

There is a presumption that the STELs should be directed solely towards a specific track of curriculum, ITEEA's Engineering byDesign™. Although it would be great if schools in all 50 states and in other countries followed the EbD™ curriculum, it is not realistic to expect this. Different locations have their own focused frameworks and expectations. The ITEEA Engineering byDesign™ preK-12 program can be used as a base curriculum and modified by local educators to meet the differentiated model of instruction. ITEEA believes that we must engage all curriculum developers, regardless of regional specifics, for the purpose of promoting the STEL benchmarks and practices within their contexts.

12. In Chapter 1, you refer to “technologists.” I have never heard of that job position. What do you mean?

You are right, there is no general job title called “technologist.” There are some specific job titles (e.g., medical technologist, architectural technologist, and many others) but STEL is referring to someone who has studied technology and engineering within a curriculum based on STEL. More broadly, a technologist is defined as someone who is an expert in a particular field of technology, a career trajectory that might result from the formal study of technology and engineering.

13. The material in the section on Technology and Engineering Practices seems to include personal qualities or job skills that all students should acquire. Why are these listed as being specific to technology and engineering classrooms? And why isn't computer (or digital) literacy a practice?

The eight selected practices were derived from scholarly literature and are foundational to technology and engineering. All individuals should be exposed to these practices to develop technological and engineering literacy. It's true that many are emphasized in other school content areas (e.g., critical thinking in English Language Arts, cooperation in elementary school, creativity in arts), in technology and engineering education contexts all eight practices can naturally be emphasized and taught in an integrative manner. Systems thinking and making and doing, in particular, are central to technology and engineering contexts. Computer literacy is embedded in work students do in different contexts and is a literacy covered in multiple content areas, not just in technology and engineering.

14. The examples given don't seem to be linked in a progression of a single topic or activity. How can a teacher use these to develop lesson plans?

Learning progressions are decided in the context of specific course/curriculum models and in scope and sequence plans developed by states, countries, and/or school districts. The examples provided in the Contexts section of STEL deliberately used different settings and unit activities to suggest to the reader a range of applications. The STEL benchmarks are not intended to serve as a curriculum. The important point is that in any context, project, activity, or lesson, curriculum developers should focus first on the STEL benchmarks they are trying to teach and then link these to the technology and engineering practices that match the lesson being developed. Support tools provided in STEL and on the ITEEA website will help curriculum developers identify the cognitive, affective, or psychomotor verb used in each STEL benchmark as well as find links to benchmarks from other national standards (Next Generation Science Standards, Common Core State Standards for Mathematics and English Language Arts) at each grade band (preK-2, 3-5, 6-8, and 9-12).

15. Why is Context #2 called “Material Conversion and Processing?” I thought it was to be called Manufacturing.

Part of the review process including reading and thinking about the editorial suggestions made by experts in the field. There was a distinct effort to move away from the Industrial Arts categories of the 1970s, which included manufacturing, toward more modern and inclusive language that better represents technology and engineering activity in the various contexts. Calling the context Material Conversion and Processing makes the setting, and what students should be making and doing in that setting, clearer. This should help teachers to go beyond projects like simulated mass production lines to include activities such as material testing, resource assessment, and project management.

16. Why is Context #6 called “The Built Environment?” It has always been called Construction.

The traditional content of construction in Industrial Arts focused on bridges, homes, commercial buildings, infrastructure, and carpentry. The title “Built Environment” is considered more up-to-date nomenclature that covers the broader structures that students could work on. Built environment refers to any human-made environment that provides a setting in which human activity takes place. It refers in the broadest sense to any physical alteration of the natural environment, from homes to cities, through construction by humans. It includes built forms, building types, and spaces (covered or uncovered) that are defined and bounded, such as plazas, streets, walkways, landmarks, and playgrounds. Built forms may also refer to specific elements of buildings (such as doors, windows, roofs, walls, floors, and foundations) or to spatial subdivisions of buildings. Therefore, the term built environment was selected because it is much more inclusive than the term construction.

17. Some of STEL includes language from the original 2000 STL. Why is this?

The original Standards for Technological Literacy (STL) was a project that spanned almost a decade, with hundreds of reviewers and substantial financial support. The validity of STL cannot be overstated and the document has been translated into multiple languages and adopted around the world. In making a decision 19 years later to update the discipline's content standards, ITEEA had three options: (1) make minor edits with a 2020, 4th edition copyright date; (2) wait until the organization received a large, multi-year grant to support a revision project similar to the original STL; or (3) start a process somewhere in between with a more modest level of funding that would allow for critical changes to be made to the standards that reflect current educational thinking and practices and that respond to the needs of the field. Option #3 was the path chosen, with the understanding that STL provided a strong foundation from which to work. STEL contains some familiar sections from STL but provides important updates to make the standards more relevant and more usable. Moving forward, STEL will be a dynamic set of standards providing examples that embrace and deliver a comprehensive methodology to assure technological and engineering literacy is achieved for all.

18. What are the plans to release the *Standards for Technological and Engineering Literacy*?

*The journey to Standards for Technological and Engineering Literacy (STEL) began nearly two years ago and the progress has been remarkable. This NSF-funded project paved the pathway for input from thousands of professional educators from within the U.S. and across the globe. The 12-page Executive Summary has been finalized and is currently in print production. Print subscribers of ITEEA's *Technology and Engineering Teacher* will receive a copy of the Executive Summary in the March issue, due to be delivered in late February, and attendees at the 2020 ITEEA conference will receive a copy on site in Baltimore. Meanwhile, work continues to ensure that STEL includes opportunities for input from ALL stakeholders. Once the lead writing team completes editing the third draft of STEL, ITEEA will make available the latest draft on its website, prior to the March 2020 conference. This third draft of the full STEL document will be available for download and comments by the membership at large. All comments and suggestions will be reviewed and, when appropriate, incorporated into the final document, which is expected to be released in summer 2020. In addition, an interactive website will be released, which includes curriculum development resources, (e.g., a STEL benchmark matrix that links to three other academic sets of benchmarks [NGSS, CCSS ELA and CCSS Math]; and a Bloom's Taxonomy verb matrix). For more information, plan to attend the Baltimore conference where there will be six presentations about the project and resulting STEL document, and visit the [ITEEA website](#) for updates on the revision project.*