Integrating Literacy with STEM

About this Resource

This implementation guide takes interested parties through a process of how the project decided to integrate literacy with STEM. It begins with the benefits of doing so, clarifying the types of literacy standards that are integrated, processes for placing standards into the unit and individual lessons, and expounds on the inclusion of vocabulary lists.

Why Integrate Literacy with STEM?

Research demonstrates the positive effects gained in ELA when students engage in integrated STEM instruction (The Education Trust–West, 2017). The experiences facilitated by the integrated STEM units are prime opportunities for students to practice and grow in their language skills. Further, the units provide a cohesive and connected set of experiences all relating to the central design challenge, so that language practice is embedded within a context that provides meaning. This is a shift from traditional practices where students experience fragmented language opportunities that move around between isolated, unrelated topics each day. Integrated STEM provides a unifying theme for which students can make meaningful connections to language related to rich STEM experiences.

Clarifying Which Sets of Standards by Teacher Role

In Tracy Unified School District, teachers of pre-kindergarten through sixth grade teach multiple subjects (e.g., STEM, ELA, History-Social Science). Integrating literacy within STEM for this group of teachers brings synergy to their efforts and mutual reinforcement of content areas. Teachers who teach math and science courses to seventh grade and above supplement their course-specific standards with the disciplinary literacy standards found in the California-adopted Literacy Standards for History/Social Studies, Science, and Technical Subjects (see pages 79-89).

Choosing Standards for the Integrated STEM Units

For the elementary units, the district formed a team to review and select priority standards to focus on at different points of the year. The Standards and Curriculum Team identified where the priority standards should be placed most appropriately in the units to be sure they are taught concurrently during the integrated STEM unit experiences. Following is a standard that appears in nearly every elementary STEM unit, though looks slightly different based on the grade level.

For the secondary units, the Standards and Curriculum Team identified several standards for disciplinary literacy to integrate based on the course, topic, and relevance for the unit.

Placing Integration Moments within 5E Learning Sequences

As a part of making the units come alive for students, teachers develop learning sequences related to the concepts associated with their design challenge. This work has become a focus of the district professional learning communities (PLCs) work and is based on the BSCS 5E Instructional Model (BSCS, 2006).

The following graphic for Grade 7 Math highlights literacy integration moments in a 5E focused on proportional relationships as they relate to stretchy materials. This connects to the design challenge where students build their own bungee system that can drop a weight to the ground without making contact. (Note: The parentheticals denote standards for disciplinary reading (R) or disciplinary writing (W) for technical subjects.)

ENGAGE
- View two bungee-jumping videos and compare the two approaches (R.9)

EXPLORE
- Draw a schematic diagram of stretch trial then carry out trials of stretch testing (R.3)

EXPLAIN
- Add text to diagram to annotate what is happening in your approach (R.7)

EXTEND
- View online expert from rubber band factory, add evidence for or against your idea (W.8)

EVALUATE
- Read real-world scenario to analyze and post solution and justification online (W.1, W.6)
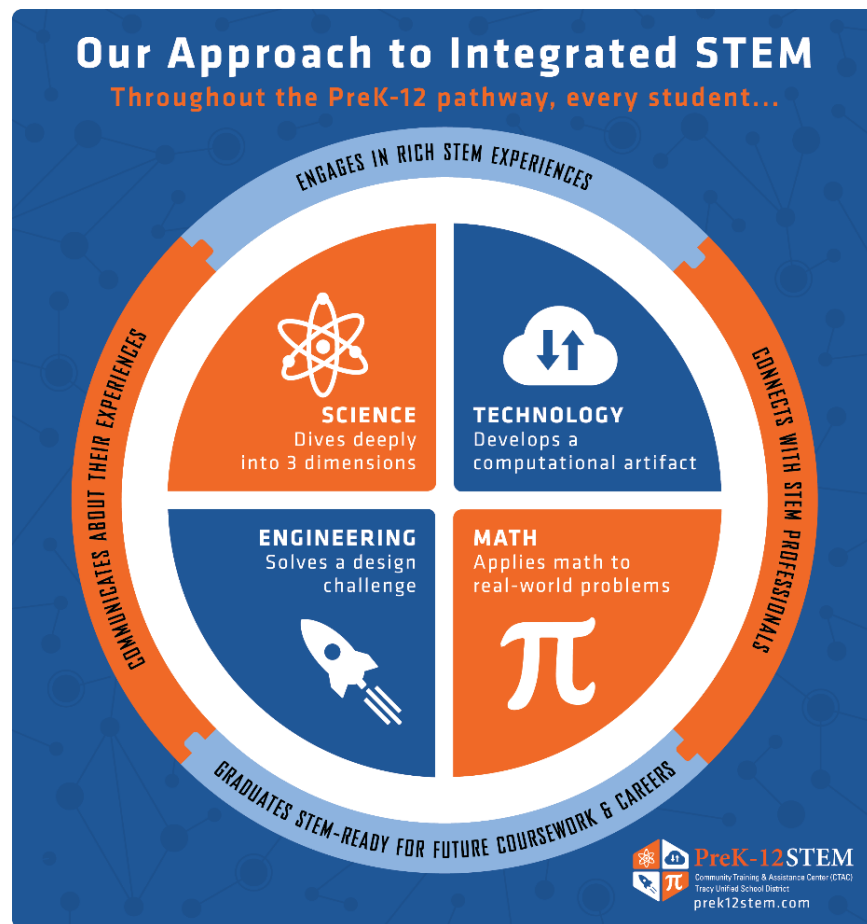
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Using Vocabulary Lists

Each unit contains a set of vocabulary terms that relate to the content in the unit. Most of the definitions come either from respected national organizations (e.g., National Council for Teachers of Mathematics, National Aeronautics and Space Administration) or from unit designers themselves to give local context to the definition.

The terms are not meant to be front-loaded ahead of the unit or used an activity for students to copy or regurgitate definitions. Rather, the terms reflect important content in the unit that students should make meaning from based on the engaging and innovative experiences within the unit.

Final Thoughts

Integrated STEM provides frequent and natural opportunities for students to grow in their language skills. While bringing these two content areas together can require a shift in thinking, it is a far more valuable instructional move for students to provide explicit opportunities for students to communicate about their experiences. Thus, we have placed it as a vital component of our approach to integrated STEM.

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