

## Content Advisor Feedback – Zimmerman

Please review the draft recommendations for the science Texas Essential Knowledge and Skills (TEKS) for kindergarten–grade 8.

- The Draft K-8 TEKS have considerably improved the vertical alignment and scaffolding of concepts. The progression in complexity and to more abstract science concepts is clearer and more purposeful in alignment with the K-12 Science Framework and will provide students a stronger foundation for HS level courses.
- MS TEKS have been rearranged significantly to balance the scientific disciplines throughout each grade 6-8 for scaffolding to build conceptual understanding for students. The WG similarly rearranged SEs in Elementary to provide more logical and developmentally appropriate progression of concepts.
- Recommend time given to Work Groups to further analyze the vertical alignment of K-12 now that the draft revisions are available to ensure that the intention of the backwards design was met and no gaps or unnecessary duplication of concepts occurs. Content advisor and teacher feedback will be valuable for this.
- There will be need for teacher PD to analyze the alignment and depth of instruction before implementation so that teachers at these levels (many of whom are generalists) are confident in their knowledge, preparation, and instruction. TEKS Guides will also aide in this.

### GUIDING QUESTIONS

Do the standards for the grade(s) adequately address scientific concepts? If not, please give examples of how the standards might be improved.

- KS 6.5 states students know that matter is made of atoms – where is the SE or clarification for this concept? There is no mention of atoms other than energy of atoms in the phases of matter.
  - o 5.5D has students model how matter can be divided into particles that are too small to be seen as a foundation but it is unclear in this strand in MS when and at what depth of expectation atomic structure is taught
  - o Further question about 5.5D – how will students model that matter can be divided into particles too small to be seen? This is an abstract concept - will TEKS guide provide potential instructional activities to address this concept?
- Previous 7.5A – radiant energy transformed to chemical energy by photosynthesis – suggest returning this TEK as the incorporation of the concept in the revised 6.7B SEs may not give sufficient consideration to this important concept
  - o Allows for better alignment with 8.5D if more thoroughly covered in 7<sup>th</sup>
  - o Also better builds upon how concept of photosynthesis is learned in 4<sup>th</sup> grade (4.11A) and helps solidify foundation for Biology
  - o Current revisions mention only photosynthesis specifically in energy transformation 6.7B and conservation of mass 8.5D – inclusions without further depth of instruction seem fragmented

- 6.10 – student understands how resources are managed; suggest additional SE to further address the concepts of limited resources for human use being distributed in varying amounts in regions on Earth
- 7.11A (suggested to move to 8.11A) – should include immune system as well

Is the level of rigor appropriate for each grade level? If not, please provide suggestions for areas where improvements are needed.

- 8.5B – students do not have prior instruction in polarity or bonding so SE should provide basic observation of properties resulting from these abstract concepts taught in depth later; TEKS Guide can provide boundary of instruction
- 8.7C – “explain use of electromagnetic waves in applications”; this is first instruction for waves – better verb would be “describe”
- 3.11D – fossils as evidence of past living organisms moved from 5<sup>th</sup> to introduce earlier but aligns better with geological concepts taught in 4<sup>th</sup>; suggest moving 3.11D to 4<sup>th</sup> to align with 4.9B and move 4.11C back to 5<sup>th</sup> to align with 5.9C
- 4.5B – explore the conservation of matter is an abstract concept – should this be delineated as a separate SE with further clarity given for the level of understanding expected?

Are the TEKS aligned horizontally and vertically? If not, what gaps or concepts are missing that should be addressed?

- Alignment across grades is overall improved. For example, very much agree with WG decision to introduce K-2 to different forms of energy but explore one in depth in each grade level – good instructional practice and alignment
- A few suggested rearrangements or needed clarifications:
  - o 1.9C and 2.9A – increase in rigor not significant – suggest change of verb to “demonstrate” – also allows for lab-based student inquiry
  - o 6.5B and 8.5A – how is the depth of knowledge required here significantly different?
  - o 6.5E – suggest move to 7<sup>th</sup> as expansion of 7.5B physical and chemical changes
  - o Suggest moving 7.11A to 8<sup>th</sup> grade and 8.11A to 7<sup>th</sup> – organ systems are macro scale of cellular organization
    - Provides scaffolding from cell to cell parts to organ systems
    - Also suggest moving 6.11B to 8<sup>th</sup> grade to align with organ systems and 8.11B to 7<sup>th</sup> to align with 7.12A
    - 7.11B – disjointed from other SEs that were moved to 8<sup>th</sup> grade – revisit for fit with this KS
  - o 6.5B –the term pure substances refers to elements and compounds but compounds are intended to be further examined in 7<sup>th</sup> grade – edit this for clarity of instructional intention and scaffolding

Does each grade level include sufficient standards focused on classroom and outdoor investigations?

- Yes, useful for TEKS guides to provide suggested investigations as well to help teachers design instruction.

Are the student expectations clear and specific? If not, please give examples of how the language might be improved.

- Work groups did well overall in clarifying wording and providing specificity. A few suggested edits:
- K.5A – include “size” in list of observable properties to allow for more description and introduction to quantitative measurements
- 1.11C – clarify that “**some**” plants depend on other living things for pollination and seed dispersal as many use wind and water as well
- 3.11C – recommend deletion of “or move to new locations” to not foster misconceptions that animals can just move to another place to survive an ecological disturbance
- Parallelism for KS7.3 – begin statement with “the student knows that energy exists in many forms”
- 3.9A – addition of “such as” statement does not clarify as intended; possibly reword to “soils such as sand and clay are formed by...”
- 6.5C – provide suggested physical properties as a “such as” statement to clarify how these can be classified (luster, malleability, conductivity)
- 7.5A – for describing elements and compounds how are “atoms and molecules” different from “structure”? - suggest deletion of “structure”
- 7.12A – “natural and artificial selection change **the frequency of** genetic traits in a population”
- 7.14B – intention of SE better clarified with this edit “describe the characteristics of the recognized kingdoms and identify various functions of member organisms within ecosystems such as bacteria aiding digestion and fungi decomposing organic matter”

Are there student expectations that are not essential or unnecessarily duplicative and can be eliminated? If so, please identify by grade level and student expectation number, e.g., 1.7.B (Grade 1, student expectation (7)(B)).

- 6.7B – energy transformation in food webs and photosynthesis – do students have enough background in these concepts to understand these as biological energy transformations? Seems disjointed to add the concepts here.
- 7.13B – biodiversity is addressed in 13C with no additional depth – suggest rewording 13B to focus on flow of energy and recycling of matter and nutrients (biogeochemical cycles) and 13C will address biodiversity; also suggest clarifying which biogeochemical cycles should be taught (carbon, nitrogen, oxygen) or is the expectation a general understanding that matter cycles?

Do you have any other suggestions for ways in which the elementary and middle school TEKS can be improved?

- TEKS Guides will be important for the TEKS to be implemented with rigor and specificity – example: 8.8C – provide examples of scientific data that is used as evidence of formation of universe – red shift, cosmic background radiation and 4.5B – provide

guidance for investigations that allow exploration of concept of conservation of matter at this basic level

#### Feedback on Introductions 6-8:

- Overall, appreciate the intention of the introduction to provide summary of strands for the course along with previous expected knowledge and boundary of instruction for further courses.
- Need to ensure review of introductions to align with any further edits or rearrangements of SEs in these courses.
- 6.1B – intro states students will learn about compounds in later grades but SE 5B wording is pure substances which include elements and compounds
  - o SE should be clarified for scope and intro edited to match
  - o Sentence about compounds makes more sense after the sentence about elements before “student have previous experience with mixtures”
- 6.1C – from “energy occurs as either potential...changing from one form to another” written as scientific statements not student expectations – suggest editing to align with what students will learn and do
- 6.1E – similar to 1C from “all living organisms...communities, population, and organisms” are statements and not written as what the students will be learning and doing
- 7.1B – compounds as pure substances in intro (need to ensure clarification and alignment with 6<sup>th</sup> grade SE)
- 7.1B – suggest edit “understanding of mixtures by exploring aqueous solutions” because 6<sup>th</sup> SE was homogenous and heterogenous mixtures
- 7.1C – similar to previous suggestions for introduction – rewrite as descriptions of student learning expectations
- 7.1E – edit to “students will understand how **frequency of** traits in populations” and delete “and how characteristics determine their classification” (unnecessary clarification)

#### Feedback on Scientific and Engineering Practices

- Elementary 1D – list of tools is written as including (which designates must be used) while 6-8 is appropriately written as such as (provides examples but not all required)
- 6-8.2D - Agree with viewpoint to add potential criteria for evaluation of experimental and engineering designs – possibly effectiveness at addressing question or problem and efficiency
- 6-8.4C - Do not agree with viewpoint to replace with “research three resources...” and “identify three resources to identify mentors for interviews” – this is too constrictive for teachers; many of the suggested resources have educational outreach programs that already work with our schools – the SE is appropriate as written to give students a range of opportunities to connect content to careers