Guidelines for Content Advisor Feedback on the Science Texas Essential Knowledge and Skills

Please review the current Texas Essential Knowledge and Skills (TEKS) for kindergarten–grade 12 science and use the following questions to develop feedback for the State Board of Education regarding revisions to the standards.

There is no specific format required for your feedback. When referencing specific portions of the TEKS, please indicate the grade level and/or course and the specific letter/number of the standard to which you are referring, as appropriate.

Guiding Questions

1. Is the current structure or framework of the kindergarten–grade 12 science TEKS appropriate? If not, what recommendations do you have for organizing or structuring the TEKS?

   The current structure or framework of the K-12 grade TEKS does require improvement and restructuring. The current structure of Introduction, Science Strands, Process Skills, and Core content standards should be modified to incorporate up-to-date knowledge/skills and applications or connections to the real world. Reviewing several examples of other "Standards" provides insight as to what the revised standards can be transformed to more relevant/meaningful for students and educators including the ease and user-friendliness of framework.

   As the standards are revised, a newer up-to-date framework will emerge that highlights the major components of the standards. A recommendation to the science working groups would be to review the frameworks from current examples of "Standards" from different educational entities to see how the standards are written and framed.

   Another component of the framework that our working groups should consider is the addition of Performance Assessments or a section on how teachers can measure mastery of the standards. This could be included as part of the TEA TEKS Guides which give further clarification on how the standards could potentially be taught. The Performance Assessments would indicate HOW students will demonstrate their knowledge of the specified standards. These Performance Assessments can then be written in a way where there are options for students and teachers to have choice for demonstrating their knowledge. For example, students can demonstrate specific skills by conducting a lab, presenting a product, or defending or arguing ideas.

2. Does each grade level and/or course follow a complete and logical development of science concepts presented within the grade level/course? If not, what improvements are needed?

   For the most part, there is a logical sequence of science content presented and developed throughout the K-12 standards. However, a careful review would require working groups to study the vertical alignment and spiraling of standards as concepts move up grade levels. This revision process will allow working groups to do a total and complete overhaul of standards if necessary. Working groups should ensure that content gaps are addressed at each grade level and content is consolidated when appropriate to more concise, direct standards. This revision process provides the opportunity to delete, add, enhance, modify standards as we see fits the needs of our students- state wide.

Some things to consider when revising the standards include ensuring the cognitive levels and content is age and developmentally appropriate. Also consider and be open to the belief that students can perform at higher cognitive levels, even at lower grades. The working groups must keep in mind that the revised standards will eventually guide what is later identified as the assessed curriculum. Working groups need to let go of what they know, or what they traditionally expect our students to learn at each grade level and be open to setting a new norm for what is to be taught and eventually tested at each grade level.

Working groups should focus on trimming down the amount of standards required at each grade level and consider if it is absolutely necessary to cover several science strands in one grade level? Does this allow for depth or breadth when teaching concepts? Once again, this begs for a review of postsecondary success data and correlation to standards to see which entities are being successful and how aspects of these systems/organizations be replicated at our level.

3. Are the core concepts specific to the disciplines of science (e.g., life science, physical science, and earth and space science) adequately addressed across the K–12 TEKS? If not, please identify the discipline and the concepts that are missing.

   The major disciplines of science are presented in the TEKS through concepts related to life science, physical science, and earth & space science. My recommendation is to include “Computer Science or Computational Thinking”, “Engineering Design & Problem Solving” (through the Process Skills), and an emphasis on “Advanced Technologies”. A section on cross curricular and real-world connections could help to bring the standards to life, making the standards meaningful for students and providing educators a way to make the standards relevant.

4. Do the standards adequately address the broader concepts that cross various science disciplines (e.g., systems and system models, energy and matter, stability and change)?

   Additions to the broader concepts can include: “advancements in technology” and “engineering design” as possible new additions or replacements of the current broader concepts.

5. Are there topics that should be eliminated because they no longer reflect current research or practices within the field? If so, please identify.

   A careful review and study of the standards should be conducted by the working groups to identify standards that should be eliminated or those that no longer meet current needs or current research. New advancements in cellular biology, viruses, space science, etc. will require standards to be rewritten or eliminated.

6. Are the TEKS vertically aligned so that concepts are introduced, elaborated on, and refined across multiple grade levels and students will possess the necessary knowledge and skills to be successful in later grades?

   No, some courses are not vertically aligned in a logical, effortless way. A backwards design process could allow groups to start with the end in mind so that concepts are not presented too early or not elaborated at a later grade level after the concept has been fully matured. For example, in Biology the ecosystems should align to support a smoother transition to higher level courses, such as AP Biology. Biology ecosystems should move beyond predator/prey relationships to calculating biodiversity, equilibrium, human impact and environmental solutions, etc..

7. Do the high school courses sufficiently prepare students for postsecondary success?

   A review of data for postsecondary success will need to be conducted to see how the standards impact student success beyond high school. For example, how many students are successfully completing higher level courses without the need for remediation or re-taking of a course. The working groups will need to review which state standards are meeting the mark and showing high success rates of student entry/completion of postsecondary courses.

   Revisiting an earlier response, where a backwards design focus must be used as a lens for revising the standards is important for the working groups to consider. The working groups will need to work backwards from higher level courses to introductory courses, Middle School working groups need to see the end in mind as to what is required at the high school level, and elementary working groups will need to see what is required once students enter the middle school level. The grade levels should grow and build onto each other in reference to content, process, and cognitive level of understanding.

8. The current K–5 science TEKS <u>encourage</u> districts to devote the percentage of instructional time to classroom and outdoor investigations as follows: kindergarten and grade 1–80%, grades 2 & 3–60%, grades 4 & 5–50%. The secondary science TEKS <u>require</u> districts to devote at least 40% of instructional time to laboratory and field investigations.

   Are these designations and percentages for instructional time appropriate? Do the current student expectations adequately support the instruction?

   The percentage of instructional time that is lab and field based should remain. Definitions regarding hands-on, wet/dry lab experiments, simulations, manipulatives should be expanded upon. The goal here is to support more hands-on/lab investigations where students are exploring and investigating material.

   Another consideration is to review the impact of required laboratory tools identified in the TEKS per grade level. How does this impact budget for campuses? Perhaps general statements regarding laboratory tools necessary to teach "5th grade", "Biology", "Physics" and or the idea to list terms generally such as "digital and analog measuring devices", "glassware", and "tools for measuring volume" can be used in place of listed specific items.

   The working groups should also review and be consistent with science and non-science vocabulary/terms. Also some areas may require definitions to help teacher know what is expected from the standards. This can also be elaborated within the TEKS Guides from TEA.

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

   Some student expectations are not clear or specific, see examples:

   Biology (1) Scientific processes. The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:

   A recommendation is to give specific examples that will qualify for lab and field investigations such as lab prep, data collection and analysis, graphing, group collaboration time, or other hands on activities

10. Are there student expectations that are not essential or unnecessarily duplicative and can be eliminated? If so, please identify by grade level/course and student expectation number.

   A few examples can be condensed due to duplicative wording. For example:

   #1:

   Biology 1. (A) demonstrate safe practices and consider environmentally conscious decisions during laboratory and field investigations; and

   ~~(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.~~

   #2:

   Biology 2 (C)~~ know scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed;~~

   (D) distinguish between scientific hypotheses and well established scientific theories that may be subject to change;

   A careful review of the standards will help working groups to identify the standards that need to be deleted or revised. Keep in mind this revision process gives full flexibility on deleting/modifying the standards in ways that maximize student learning and teacher efficiency and ease of teaching the standards.

11. What other suggestions do you have for ways in which the science TEKS can be improved?

Vertical alignment between the cross curricular disciplines and content areas should be included to support a more well-rounded approach to teaching. Classrooms are becoming more contextualized within real-world scenarios- having alignment between the content areas- especially within the elementary grade levels is extremely important for teachers who teach all subject areas. The working group teams should be working vertically and horizontally to support connections across the disciplines. A side by side correlation to math should also be addressed to ensure the science standards include computation thinking and quantitative reasoning within the standards. Language Arts, Social Studies, and other horizontal course should also be reviewed and kept in mind as working groups adjust standards to include real-world connections.