

## **Executive Summary**

### **Submitted by Science Standards Recommendation Committee 2022 to the Tennessee State Board of Education**

On June 9-10, 2022, the Standards Recommendation Committee (SRC) met to review the K-12 Tennessee state science standards and assess public and educator survey feedback and revisions made by the Educator Advisory Teams (EAT) and Standards Development Committee (SDC). The following brief report outlines reflections and observations made by the SRC that are pertinent for communication to the State Board of Education (SBE).

#### **Observations regarding process and timing of standards review**

The established system for reviewing standards every six years is ambitious and forward-thinking. This also ensures that the standards are updated and maintained over time. However, several weaknesses in the process are outlined below and need to be addressed moving forward.

##### **1. Surveys and Feedback**

- a. The public surveys are an important component of the process, but the SBE has informed us that dissemination of the surveys were limited by the resources. For instance, the SBE communicates the survey via email to superintendents and directors of schools, via newsletter and social media to those receiving such communications, and via news media when picked up by news sources. As a result, the feedback on the surveys is limited with approximately 400 unique individuals submitted feedback, totaling 9,371 responses, in wave 2 of the survey (per data provided by Scantron upon request).

We recommend that a more comprehensive process of seeking feedback from wide reaching sources (i. e. social media) be implemented. District superintendents/leadership should also be encouraged to share the surveys with various community stakeholders, including parents/parent groups, etc. to offer feedback. SRC members noted that the anecdotal feedback they received was that many teachers were not aware of the surveys.

In addition, the initial Scantron report from the survey did not provide basic information such as the actual number of respondents of each category (e.g., educator, public, etc.). People outside of our State could disproportionately influence the surveys as we currently have no way of knowing that the data was gathered from residents of TN. A requirement that only Tennessee residents participate in the survey should also be considered. We recommend that respondents are given the option of providing their contact info in the Comments section so that there can be follow-up (with the caveat noted in the survey that this information is open to records requests). School district/zip code information of respondents should be included as an item on the demographic section of the survey.

It also appears that there was confusion in the second survey by some respondents who did not realize the survey was not over the 2016 standards but over the proposed revisions to the standards. Perhaps this distinction can be made clearer in future surveys.

- b. The SRC was initially provided with feedback data from the second round of the survey, which was administered following the revisions made by the EAT and SDC. Later, we were provided with the feedback from the initial survey. In retrospect, some SRC members felt it would be helpful to see the revisions made to the standards by being able to compare the revised standards with the previous version more directly and have the context of the first round of survey feedback. This may require the SBE to modify some processes for the staff of the SBE to be able to provide for the SRC a straightforward way to identify the revision of the standards proposed by the EAT and the SDC. Our recommendation would be to provide all feedback surveys to the SRC at the onset of the process and also to provide any revisions to the Standards as a Word documents with Track Changes along with a summary listing of the proposed changes.

## 2. Schedule & Timing

The SRC meeting took place two months later than normal. The SBE informed the SRC that this was due to delayed committee appointments by the Lieutenant Governor and the Speaker of the House. They indicated that while the SBE requested appointments in September, these appointments occurred in March by the Governor and in May by the Lt. Governor and the Speaker. The consequence of this delay is that the SBE could not communicate critical information or hold the official meeting to the SRC until all members were appointed. Additionally, this has created a tight timeline for review and feedback on the standards by the SRC. We recommend that ample time (2 months or more) is made available between the time the SRC appointments are completed and the SRC recommendations are due to be submitted to the BOE. That will allow for informational and preparatory meetings to be held with the SRC prior to the official decision-making meeting.

In particular, the SRC needs to be informed in the framework and terminology used to develop the standards. The phrasing of the standards has specific application and implementation (i.e., Science and Engineering Practices and Crosscutting Concepts). Thus, while the language may seem obtuse in places, the phrasing/terminology does make sense considering the framework used for developing and assessing the standards. Therefore, the SRC recommends that this information be communicated via virtual meeting ahead of the SRC committee meeting. This will aid the SRC in reviewing the standards more effectively prior to meeting as a committee.

## **Summary of process of the SRC**

As a committee, the SRC approached the process by starting with Kindergarten and working up through 12<sup>th</sup> grade. In this process, we reviewed the revised standards together with the first and second round survey data. We identified the revisions made by the SDC and EAT along the way with the help of the chairs of those committees. We also utilized our own areas of expertise to consider the wording and intent of the standards. We considered and clarified potential in class applications of the standards with the help of the educators on the committee, the chairs of the EAT and SDC, and a representative of the Tennessee Department of Education.

In our revisions, the SRC's aim was not necessarily to add or take away from any standards but to consider whether clarification, expansion, reduction, or other changes were needed and justified. We consider most of the revisions made to be more of a clarifying nature for the benefit of our educators and their students. In the few cases where standards were removed, the standards were either redundant and covered elsewhere or were not needed for a particular endpoint.

## **Additional Notes and Considerations**

Several responses in the first survey encouraged the addition of standards at multiple levels related to teaching the stages of human development from fertilization to birth in an age-appropriate manner. While standards in some grades (including 3<sup>rd</sup>, 7<sup>th</sup>, and Biology I in HS) touch on the idea of life cycles and development, the committee strongly recommends that additional considerations be made to ensure students learn about this developmental process in humans. To that end, three standards were slightly revised, and a statement was added from the front matter of the 7<sup>th</sup> grade standards. The committee recommends that the SBE conduct additional studies to explore further strengthening and clarifying these standards in ways that are developmentally appropriate. It was noted that these concepts are covered in the health standards for 6<sup>th</sup> grade, but the health course is optional. Therefore, not all Tennessee students are learning this content. Additionally, the focus of the SRC is on the biology of development (i.e., from fertilization to birth) rather than the sexual reproduction process.

Another issue that was raised often in the surveys was the need to have more cohesion and connectivity between Standards and content of Textbooks. There were numerous requests from teachers to create better materials to teach the Standards that are set forth. It was noted by the members of the SRC who spoke with teachers who indicated that they are purchasing workbooks and other materials (with their own money) to be able to teach the required Standards. We recommend that the SBE/DOE work collaboratively to gain better understanding of these concerns (via surveys and direct coordination with teachers) to help ensure that teachers have the tools they need to adhere to the Standards that are established. This may require additional engagement by the State Legislature to help bridge the gap. We recognize that this work is generally done at the local level, but more should be done to help provide the tools needed by teachers.

Finally, as the SBE is aware, training our educators to understand and effectively apply the standards is critical to ensure their effectiveness in the classroom. The SRC strongly urges the SBE to aid districts and the Department of Education in providing professional development for our educators focused on these standards. It is clear from survey feedback that there is still a need for training educators in understanding and implementing these standards. Educators must understand the framework of the standards and the terminology used to describe the practices and concepts the standards encourage. Further, educators may also need examples and supplemental resources to aid in the application of the standards. Finally, as these changes may affect the assessment of students and teachers, care must be taken to ensure that standardized assessments reflect the changes to the standards where applicable. These needs may require the SBE and the Legislature to consider the funding of the review process and of the development of educational materials to provide support for what is needed by our educators.

## Appendix A – Timestamped Agenda with Substantive Changes Noted

Thursday, June 9, 2022

Video Time Stamp	Topic of Discussion
16:55	Scantron Presentation on Public Feedback Report
51:05	Roll Call for Quorum
51:45	Science Standards Development Committee Chair Presentation on Science Standards Process and Development
2:14:45	<i>5 Minute Break</i>
2:30:00	Appointing of Science SRC Chair
2:33:15	General Questions from Committee Before Work Session
2:49:40	Discussion on Best Approaches for Standards Review and Minutes Keeping
3:01:10	Kindergarten Standards Review <ul style="list-style-type: none"><li>• Substantive Changes<ul style="list-style-type: none"><li>○ Added 'i.e.' or 'e.g.' to parenthetical statements for clarity</li></ul></li></ul>
3:29:40	<i>Lunch Break</i>
4:10:10	Clarifying Parenthetical Notes and Lists in the Standards
4:16:35	Grade 1 Standards Review <ul style="list-style-type: none"><li>• Substantive Changes<ul style="list-style-type: none"><li>○ Added 'i.e.' or 'e.g.' to parenthetical statements for clarity</li></ul></li></ul>
4:27:35	Grade 2 Standards Review <ul style="list-style-type: none"><li>• Substantive Changes<ul style="list-style-type: none"><li>○ Added 'i.e.' or 'e.g.' to parenthetical statements for clarity</li></ul></li></ul>
4:47:40	Grade 3 Standards Review <ul style="list-style-type: none"><li>• Substantive Changes<ul style="list-style-type: none"><li>○ Added 'i.e.' or 'e.g.' to parenthetical statements for clarity</li><li>○ Added 3.PS1.3 - Construct an argument based on evidence that materials have both fixed and changing properties, some of which are useful for identification of a material.</li><li>○ Modified 3.LS1.1 to specify humans and other organisms</li><li>○ Modified 3.ESS1.1 to specify inner and outer planets</li></ul></li></ul>
5:26:20	Grade 4 Standards Review <ul style="list-style-type: none"><li>• Substantive Changes<ul style="list-style-type: none"><li>○ Added 'i.e.' or 'e.g.' to parenthetical statements for clarity</li><li>○ Modified 4.PS4.2 to say 'construct an explanation' instead of 'describe'</li></ul></li></ul>

- Modified 4.ESS3.2 to say ‘engage in an argument’ instead of ‘create an argument’

5:48:00

#### *5 Minute Break*

5:53:45

#### Grade 5 Standards Review

- Substantive Changes
  - Added ‘i.e.’ or ‘e.g.’ to parenthetical statements for clarity
  - Revised 5.PS1.3
    - Original: Construct an argument based on evidence that materials have both fixed and changing properties, some of which are useful for identification of a material.
    - Revised: Construct an argument using the physical properties of matter that combining substances may or may not result in a new substance.

6:22:25

#### Grade 6 Standards Review

- Substantive Changes
  - Added ‘i.e.’ or ‘e.g.’ to parenthetical statements for clarity

Friday, June 10, 2022

### **Video Time Stamp**

### **Topic of Discussion**

1:20:00

#### Finishing Grade 6 Standards Review (6.PS2.1, 6.LS2.4, 6.PS3.2)

- Substantive Changes
  - Added ‘i.e.’ or ‘e.g.’ to parenthetical statements for clarity
  - Removed standard 6.PS2.1 - Ask questions to explain the relationship between the components of a system that contribute to the stability or instability of the system and can be used to make predictions about the system’s future.
  - Revised 6.LS2.4
    - Original: Construct an explanation that describes the differences in biodiversity patterns in Earth’s terrestrial and oceanic ecosystems and use data about the completeness or integrity of an ecosystem’s biodiversity to measure its health.
    - Revised: Construct an explanation that uses abiotic (e.g., precipitation, temperature, soil) and biotic (e.g., biodiversity, number of organisms) patterns in earth’s terrestrial and aquatic ecosystems (e.g., tundra, taiga, deciduous forest, desert, grasslands, rainforest, marine, and freshwater) as measures of ecosystem health.

1:35:15

#### Grade 7 Standards Review

- Substantive Changes
  - Added ‘i.e.’ or ‘e.g.’ to parenthetical statements for clarity

- Revised 7.PS1.1
  - Original: Obtain and communicate that all substances in the universe are made of 100 different types of atoms that combine in various ways.
  - Revised: Evaluate and communicate information that all substances in the universe are made of many different types of atoms that combine in various ways.
- Revised 7.PS3.2
  - Original: Develop a model to explain how food is rearranged through chemical reactions by forming new molecules that support growth, which result in the release of energy as matter moves through an organism.
  - Revised: Develop a model to explain how food is utilized through chemical reactions to form new molecules that support growth, resulting in the release of energy as matter moves through an organism.
- Modified 7.LS1 to specify humans and other animals
- Revised 7.LS3.1
  - Original: Obtain and communicate that chromosomes contain many distinct genes which code for the production of proteins, which in turn affect the traits of an individual.
  - Revised: Evaluate and communicate information that chromosomes contain many distinct genes which code for the production of proteins, impacting the traits of an individual.

3:24:05

*Lunch Break*

4:04:20

Finishing Grade 7 Standards (Adding Development of Human Life)

- Substantive Changes
  - Added note in grade level front matter stating ‘Students learn in life science from molecules to organisms. This study should introduce the biology of human life including the stages of development from fertilization to birth.’

4:56:05

Grade 8 Standards Review

- Substantive Changes
  - Added ‘i.e.’ or ‘e.g.’ to parenthetical statements for clarity

5:04:10

Revisiting Grade 3 Standards: Life Cycles (3.LS1.1)

5:12:00

*5 Minute Break*

5:19:50

General Discussion Around High School Science Standards

5:25:00

Biology 1 Standards Review

- Substantive Changes
  - Added ‘i.e.’ or ‘e.g.’ to parenthetical statements for clarity

	<ul style="list-style-type: none"> <li>○ Modified BIO1.LS1.3 to specify ‘including human development’</li> </ul>
5:50:50	<p>Biology 2 Standards Review</p> <ul style="list-style-type: none"> <li>• Substantive Changes <ul style="list-style-type: none"> <li>○ Added ‘i.e.’ or ‘e.g’ to parenthetical statements for clarity</li> </ul> </li> </ul>
5:52:50	<p>Chemistry 1 Standards Review</p> <ul style="list-style-type: none"> <li>• Substantive Changes <ul style="list-style-type: none"> <li>○ Added ‘i.e.’ or ‘e.g’ to parenthetical statements for clarity</li> <li>○ Modified CHEM1.PS1.15 to include ‘electrophoresis’</li> </ul> </li> </ul>
6:02:35	<p>Chemistry 2 Standards Review</p> <ul style="list-style-type: none"> <li>• Substantive Changes <ul style="list-style-type: none"> <li>○ Added ‘i.e.’ or ‘e.g’ to parenthetical statements for clarity</li> </ul> </li> </ul>
6:06:10	<p>Physical Science Standards Review</p> <ul style="list-style-type: none"> <li>• Substantive Changes <ul style="list-style-type: none"> <li>○ Added ‘i.e.’ or ‘e.g’ to parenthetical statements for clarity</li> </ul> </li> </ul>
6:10:10	<p>Earth and Space Science Standards Review</p> <ul style="list-style-type: none"> <li>• Substantive Changes <ul style="list-style-type: none"> <li>○ Added ‘i.e.’ or ‘e.g’ to parenthetical statements for clarity</li> </ul> </li> </ul>
6:11:50	Open Comments on Other High School Courses and Revisiting Certain Standards
6:28:55	Discussion on Voting and Next Steps
6:32:25	Roll Call Vote on Standards
6:34:10	Next Steps



## **Appendix B – Other Materials Available Upon Request**

1. Video Recording of Standards Recommendation Committee Meetings
2. Data Reports from the Public Feedback Surveys (Round 1 and Round 2)
3. Redline Version of Standards from Science Standards Recommendation Committee
4. Redline Version of Standards from Standards Development Committee (Available September 1, 2022)

\*Please email [TNStandards.Review@tn.gov](mailto:TNStandards.Review@tn.gov) with any requests for materials.