Dear Maine DOE Science and Technology Learning Standards Review Team,

If I understand correctly, the current Maine Science and Technology Standards (within the Maine Learning Results) are under review. I would like to offer the following public comment:

It is time for Maine to **drop current Science and Technology Standards (MLR)** and **adopt the Next Generation Science Standards (NGSS)** for the following reasons:

1. Most of the Performance Indicators in the current MLR are passive, requiring a generally low cognitive participation by students -- *describe, explain, outline, give examples*. MLR Science and Technology Standards over-emphasize learning (and regurgitating) science content, and under-emphasize critical thinking, synthesis of ideas and skills, problem-solving, and reasoning about evidence.

For example, the MLR Science and Technology Standards do not provide examples of what it can look like for students to *analyze data* and *apply statistical thinking to find and interpret patterns in data, describe and reason about evidence, and communicate their ideas scientifically*. **Students in Maine’s schools broadly lack ability to engage in this level of science practice and thinking.**

For comparison, here are MLR and NGSS standards related to learning the concept of how regional patterns in movements of air masses influences weather:

**MLR:** D-2 Earth (Grade 6-8): Students **describe** the various cycles, physical and biological forces and processes, position in space, energy transformations, and human actions that affect the short-term and long-term changes to the Earth.
- **A. Explain** how the tilt of Earth’s rotational axis relative to the plane of its yearly orbit around the sun affects the day length and sunlight intensity to cause seasons.
- **B. Describe** Earth Systems - biosphere, atmosphere, hydrosphere and lithosphere - and cycles and interactions within them (including water moving among and between them, rocks forming and transforming, and weather formation).
- **C. Give several reasons** why the climate is different in different regions of the Earth.

**NGSS:** MS-ESS2-5. (Grade 6-8) **Collect data** to provide **evidence** for how the **motions** and complex **interactions** of air masses **results in changes** in weather conditions. [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. **Examples of data can be provided to students** (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).] [Assessment Boundary: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.]

2. Maine has established proficiency-based goals for high school graduation. The **MLR** emphasize proficiency mainly in content knowledge, and do not provide support for teachers in terms of what proficiency in learning scientific thinking and practice looks like, or in terms of teaching practices that support students becoming proficient in science.
On the other hand, the NGSS performance standards emphasize proficiency not just in science content (disciplinary core ideas), but also application of science practices and understanding of crosscutting concepts (such as using models, consideration of scale and proportion, reasoning about cause and effect, and recognition of patterns, system interactions, and stability and change). NGSS performance standards clarify for teachers grade-appropriate emphases and boundaries of performance expectations.

3. Many, if not most, schools and districts in Maine are already developing their curriculum and assessments around the NGSS. Professional development offered by science education stakeholders in Maine is now based on the Next Generation Science Standards. Maine educators played a key role in the development of the Next Gen Science Standards. (NGSS was developed by scientists and science educators, and is based in research. NGSS is not a product of the Federal government, as many who object to them claim.)

Finally, and perhaps most important, the Next Generation Science Standards take into account the rapid global changes that are underway, and emphasize the critical need for young minds to be able to analyze and interpret new information, reason about it in wider contexts, raise and investigate new critical questions, and communicate findings. It has never been more important to adopt more meaningful priorities for science education.

Drop the current Maine Science and Technology Standards (MLR) and adopt the Next Generation Science Standards (NGSS).

(My background: Since 2002 I have been an Assistant Research Professor at the University of Maine School of Earth and Climate Sciences, and a faculty member in the UMaine Center for Research in STEM Education (RiSE). For the past 15 years I have provided graduate-level courses and thesis advising in STEM education for pre-service teachers in UMaine's Master of Science in Teaching (MST) program. Since 2009 I have offered in-service professional development for middle and high school science teachers in data literacy. I also consult with Tuva (tuvalabs.com), a company in New York, that provides an online platform and works with school districts around the nation to incorporate of data literacy skills into science, math, technology curricula, and in other disciplines.)

Sincerely,

Molly Schauffler, PhD.

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