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To: [ED, State Board of Ed](#)
Subject: [External] PA Science Standards review summary
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Members of the State Board of Education,

When reviewing the proposed standards, I focused on K-5. I was encouraged to see the close alignment of topics and PEs (performance expectations) **by grade** were consistent with NGSS and the Framework. This is important because the DCIs (disciplinary core ideas) and SEPs (science and engineering practices) are based on learning progressions research about how learners develop their science understandings and practices in more sophisticated ways over time. To deviate from NGSS is to break from “state of the art” research on how people learn.

I noticed 2 additions to the standards for 5th (generating solutions to environmental problems and using materials for design based on their properties). These seemed reasonable and did not negatively impact the spirit of the NGSS based standards. I also noticed that a cross-cutting concept was added – sustainability – which I can get behind if there is supporting material about how this concept is framed and if there is explicit attention to this concept in the PEs (written as 3D).

As I continued reviewing the document, I found the **standards by grade band** to be problematic. More specifically, it felt like a compromise to keep existing state standards in place even though many are redundant (or in conflict) with NGSS. Moreover, unlike NGSS, I am unclear about how these other standards were developed and the extent to which research on disciplinary learning was considered. Some of the language of these standards suggests they are not grounded in contemporary theories of learning (more like Bloom’s taxonomy).

My concern over these two sets of standards follows:

1. It is confusing! Supporting elementary and early childhood educators to teach science in ways that are aligned with the framework (e.g., equitable, grounded in phenomena, sustained over long periods of time, evidence-based) is a perennial problem of practice in K-5. Let’s not make it any harder for teachers and teacher educators to do this ambitious and complex work.
2. In other standards documents with which I am familiar, when various lenses are used to slice information, it is the same information. For example, with NGSS one can view the same PEs/standards by topic or view by DCI and by grade level. In the PA proposal, the **standards by grade are completely different than the standards by**

grade band. This is both confusing and frustrating to readers, so I can imagine it is even worse for teachers who need to plan and assess instruction.

3. The standards by grade band appear to be a dumping ground for existing PA standards, like environment and ecology and technology and engineering. This is highly problematic in terms of disciplinary content and practices. Most of the environment and ecology standards overlap heavily with the performance expectations by grade, including those that relate to human activity, impact, and decision making about the environment and its protection. The cost of this redundancy just to keep EE and TE in the mix is not worth the consequences, meaning that we should avoid placing additional burden on educators to make sense of the overlapping content and discrepancies.

4. NGSS PEs integrate a combination of science and engineering practices. This format was used for the **standards by grade** level, which means that the proposed standards already address engineering and design. When engineering is grouped a second time with technology in the **grade band standards**, they are titled core concepts (are there any?) and design (like practices but not?). Having reviewed them, I do not think the language of “technology” in the grade band standards adds value to what is in the grade level standards.

I was hoping to see assessment boundaries and possibly evidence statements included with the PEs. There is some text about it in the front matter, so I expect the plan is to incorporate these moving forward. These features are essential for classroom-based assessments and high stakes assessment. I know there was originally the intention of revising the PSSAs to reflect new standards. Is this still the case? Without changing the assessments, I fear this process only serves the purpose of avoiding the unwanted title of being the state with the oldest science standards in the country – NOT modernizing standards to support youth in preparing for society and the workplace in ways that are equitable (nationally and regionally). If the end goal is to do what is meaningful and just for students, then state assessments need to be simultaneously aligned with adopted standards.

Overall, I am pleased with the **standards by grade**, which align with NGSS. This actually positions PA well to leverage resources developed by early adopters and other NGSS states and organizations. For example, OpenSciEd, which is funded by the Concord Consortium, has the following mission: *To ensure any science teacher, anywhere, can access and download freely available, high quality, locally adaptable full-course materials that support equitable science learning.* <https://www.openscied.org/about-instructional-materials/> High school and middle school curriculum materials have already been developed, and there is a call for a Grade 3-5 development team to begin work in F21 with K-2 to follow. There are also a variety of high quality, research-based professional learning resources for teachers that are aligned with NGSS. I am hoping there is interest in harnessing these resources to support teachers in making the significant curricular and instructional shifts needed to successfully implement the

new standards.

Respectfully,
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