KS STATE REPORT

General Survey on ALL K-12 Standards - Recommendations for Improvement (Open Response) - Comments

The general response of the Kansas group is that we like the direction that things are going, but there is still work to do. In addition to the specific feedback on individual performance expectations that follows, we have feedback on several topics to offer in guiding the revisions for the next draft.

Engineering Integration—

The Kansas Review team generally liked the intent of the engineering integration and still think that this direction is the right way to go, but this first stab at integration was quite rough. There needs to be a more coherent representation of the cyclical iterative process of engineering across the topics. At this point it seems quite haphazard. Part of this could be accomplished by making sure that the practices verbs are more clearly engineering—investigate seems more of a science term, but was used in quite a number of the "engineering" PEs. Another aspect of engineering that seems to have been lost in the integration is iterative prototype development. In ideal solutions students are evaluating designs and they must have the information (criteria) that led to creation of those designs. They need to propose the next iteration and how it will solve the problem. We would like to see more integration of engineering within the life sciences and wonder if the bioengineering of prostheses and artificial joints and/or biotechnology are fertile ground for this connection.

Math Integration—

The Kansas review group was generally positive about the level of integration of mathematics and the resulting narrowing of grain size in PEs. In some of the PEs (as is indicated in the later feedback) it would be helpful to actually have more specificity at least within the clarification statements and'or assessment boundaries that more explicitly makes connections to the common core. For example, rather than just having a generic "analysis of data," it would be helpful to refer to specific data analysis skills that are called for at that level by the CC.

Elementary topics and storylines—

We liked the changes in elementary topic names to better represent K-12 progressions while retaining elementary-friendly language and the elementary storylines were also helpful. We hope these will be stretched into a K-12 narrative.

Nature of Science—

We like the general pattern of highlighting what is there in terms of Nature of Science rather than adding additional PEs. In some PEs, changes that were made to highlight NOS resulted in clunky PEs. The NOS emphasis

Assessment boundaries—
Though it is mentioned in the front matter, our group thinks that there needs to be a way to emphasize that assessment boundaries are not necessarily instructional boundaries. This might be through a mouse-over on "Assessment Boundary" that says something to the effect of, "Assessment boundaries are put in place to delineate what is expected of all students and to keep the focus on depth over breadth, but do not mean that topics beyond the scope of the assessment cannot be a part of instruction," and/or through changing the language within the assessment boundaries from stements like, "is not intended" and "is not required," to " is beyond the scope of an assessment based on these standards for all students."
Cross-disciplinary topics—
It may well be too late for this shift, but we would like to see at least one deliberately cross-disciplinary topic in MS and HS. Though topics aren't exclusively DCI specific, it would be appreciated if there was more of a deliberate and explicit effort to be cross-disciplinary.
Topics vs. DCI arrangement—
With the matrices that make a comparison of both arrangements, this is less of a concern for us—it is likely that the primary use for teachers in KS would be the online version anyway. It is much more about the professional development that supports the standards than it is about the default arrangement. If KS successfully adopts these standards, I will certainly encourage districts to save their money and use the online version. The topics would be more valuable and more meaningful if they were deliberately cross-disciplinary.
Models—
It would be helpful to use modifiers of "models" whenever possible. There seem to be many times when a particular type of model is implied by the PE, but the generic "use models" or "create a model" is used. This practice is a stretch for teachers and it would be helpful if words like conceptual, physical, mental, etc. were used to modify model whenever appropriate.
Survey tool—
MUCH MUCH better! The arrangement of the questions and the navigation through the survey were so much more user friendly than the previous rounds! With the electronically dynamic review of the public draft, it would be good to have questions about K-12 progressions paired with a matrix that has PEs as clickable links.

K.IRE Relationships in Ecosystems: Animals, Plants, and Their Environment - K.IRE Relationships in Ecosystems: Animals, Plants, and Their Environment - Suggest possible changes for those performance expectations that need additional work:

K.IRE.a--It would be wise to have guidance in a clarification statement here about not instilling the misconception that plant mass comes from the soil.

K.IRE.a and K.IRE.b- "Make observations" would be much stronger than the passive "Use observations" and indicate that students are actually observing rather than using someone else's observations.

K.SPM Structure and Properties of Matter - K.SPM Structure and Properties of Matter - Suggest possible changes for those performance expectations that need additional work:

K.SPM.b It should be highlighted in the in S and E Practices foundation box that "plan and carry out investigations collaboratively" is about developing collaborative 21st Century skills and not just group work due to equipment needs.

K.SPM.c should be "and" manufactured, not "or"

K.SPM.d-wording is awkward...ask questions about observations? Suggestions--Ask questions aimed at determining if human-made products were made from natural resources.

K.WEA Weather - K.WEA Weather - Suggest possible changes for those performance expectations that need additional work:

FYI--This is probably due to a later name change of the topic, but the pdf has this as Weather and Climate (WC) and the survey has it as Weather (WEA).

Is the expectation that students can do these independently or with support/as a class? If it is independently, then C and D are probably more appropriate for a higher grade level.

K.WEA.c needs help - what is meant by "students are to develop, use, and share representations of weather conditions.... and identify patterns- not user friendly wording for elementary teachers - needs to show more of what the S and E practices box explains for this in the standard.

K.WEA.d - Understanding that different types of weather occur in different places would require some knowledge of maps and temperatures based on latitudes and proximity to oceans. If we left off the phrase "that occur in different places" it would be more grade appropriate.

K.WEA.e awkward wordin- Suggestion: Ask questions about how scientists study weather and obtain information about the uses of technologies to gather weather data and make predictions about wether events.

1.SFIP Structure and Function and Information Processing - 1.SFIP Structure and Function and Information Processing - Suggest possible changes for those performance expectations that need additional work:

SFIP.b is awkward - what does this mean? Is this a typing error - the standard does not make sense as written b - a clarification statement would be helpful for this PE. Suggestion: Design a solution to a human problem using information gathered about how animals move. [clarification statement still needed] THe questions part is forced here.

1.SFIP.c THe claim is already made. They are either determining the claim--whether or not plants or animals of similar types have similarities and differences, or they are gathering evidence to support the claim that they do

1.W Waves: Light and Sound - 1.W Waves: Light and Sound - Suggest possible changes for those performance expectations that need additional work:

1.W.a-Suggestion: ...light bounces off an object and then travels to your eye.

1Wb - A clarification statement would be helpful for types of investigations.

1Wc - The cross-cutting concepts implies student tests, but the practice is about gathering information

General comment - The science and engineering principles on We, Wc, Wd are a bit confusing. Most of these require the students to record and observe, so should this not be done for all?

2.ESP Earth's Surface Processes - 2.ESP Earth's Surface Processes - Suggest possible changes for those performance expectations that need additional work:

2.ESP.a--"home" is watering down expectations. Habitat should a word that used consistently and thus would be appropriate for grade 2.

2.ESP.b. - The performance expectation is about landforms so the clarifying statement should be more focused on landscapes (e.g., desert, wetlands, rain forests) rather than water bodies (e.g., oceans, rivers, lakes).

ESP.d wording is awkward and a clarifying statement would be helpful.

2.SPM Structures, Properties and Interactions of Matter - 2.SPM Structures, Properties and Interactions of Matter - Suggest possible changes for those performance expectations that need additional work:

2SPM.b - The standard is too broad - build an object - additional information or clarification of types of objects would be useful. The crosscutting concept for this standard mentions environmental impact, but the PE does not. It's not entirely clear why this PE is in this topic--maybe connecting the comparison to the materials they are built from would make this connection

2.SPM.c--Suggestion-- "...some changes to objects..."

2.IRE Interdependent Relationships in Ecosystems - 2.IRE Interdependent Relationships in Ecosystems - Suggest possible changes for those performance expectations that need additional work:

2.IRE.b This is something I have done with 3rd grade science classes which have learned about plants' needs and seed dispersal in 2nd grade. I don't feel that my 2nd graders would be developmentally ready to do a thorough job with it and so would not learn as much. Evidence supports a claim--the argument links the claim to the evidence.

2.IRE.d "are extinct" rather than "that once lived"

2.FM Forces and Motion: Pushes and Pulls - 2.FM Forces and Motion: Pushes and Pulls - Suggest possible changes for those performance expectations that need additional work:

2.FM.a refers to only one or two pushes or pulls in the clarification statement. This restriction doesn't seem to be necessary

2.FM.b--how fast they are going before or after the collision or both--please clarify

2.FM.c clarification statement--on observations of

2.FM.d - A clarification statement would be useful here.

3.WC Weather and Climate - 3.WC Weather and Climate - Suggest possible changes for those performance expectations that need additional work:
For relevance of D, the last two bullets from the influences of engineering cross cutting concept are most appropriate. It's also important that we show the relationship of the standards such as 3.WC.d and 3.FM.b are very important to one another. Clarifying statements are really important here.

3.MEOE Matter and Energy in Organisms and Ecosystems: Environmental Impacts on Organisms - 3.MEOE Matter and Energy in Organisms and Ecosystems: Environmental Impacts on Organisms - Suggest possible changes for those performance expectations that need additional work:

3.MEOE.b-a fits better with this practice--this is more about obtaining information than about analyzing data

3.MEOE.c--an argument links the claim to the evidence; the claim is given in the PE; Suggestion--Obtain information to construct an argument that supports the claim that changes in a habitat may be beneficial or harmful to different organisms in the same habitat.

3.SFIP Structure, Function and Information Processing - 3.SFIP Structure, Function and Information Processing - Suggest possible changes for those performance expectations that need additional work:

3.SFIP.b--though the team was generally positive here, some thought that testing and comparing designs would require several students or groups of students to design the same solution, then determine controlled testing and comparing the results, this seems too much to expect of 3rd graders; it would be helpful to provide potential criteria for evaluation

SFIPc - teachers may need clarification on this more than just learned and innate behaviors, they will need examples

3.FM Forces and Motion: Interactions - 3.FM Forces and Motion: Interactions - Suggest possible changes for those performance expectations that need additional work:

3.FM.a-wording is awkward and seems manipulated to work a practice in...what is really called for here is "Identify repeated patterns in the motion of objects and use these patterns to create a simple model that can predict future motion" or if the practice has to be first, "Create a conceptual model based on a consistent pattern observed in a moving object that can be used to predict future motion of the object."

3FMd - very vague. A clarification statement is needed. Does the teacher provide the problem? Who decides the problem?

4.IVT Inheritance and Variation of Traits: Life Cycles and Traits - 4.IVT Inheritance and Variation of Traits: Life Cycles and Traits - Suggest possible changes for those performance expectations that need additional work:

IVTb - "influenced by the environment" will require clarification. It needs more than just the assessment boundary.

4.IVT.a--Betweeen the PE and the clarifcation statement (including in the foundation box below, there is a confusion between life cycles and the cycle of life. Death, a part of the cycle of life of an individual, is not part of a life cycle (which is a feature of the species not just the individual). Death is part of a life history which, though typical for the species, is specific to each organism. The whole concept of a cycle is that it is ongoing and thus can't continue if there is death as part of it. Do we want kids to know about life cycles, life histories, or both. We just shouldn't include death as part of a life cycle. leave death out of life cycles

4.ESP Earth's Surface Processes - 4.ESP Earth's Surface Processes - Suggest possible changes for those performance expectations that need additional work:

4.ESP.a - not plausible to test all of those

4.ESP.b - this will be hard for many urban students other than looking at man-made structures and the effects, who are the peers this is referencing?

--lots of overlap between a and b--don't think a is needed with b there

4.ESP.c needs a clarifying statement--are we really wanting them to develop the explanation or link the evidence to the explanation?

4.ESP.e - Needs to be rewritten for clarity of expectations.

4.E Energy - 4.E Energy - Suggest possible changes for those performance expectations that need additional work:

4Eb - Why does this need to be magnets? Could it be something else? This seems very directive.

4Ec - Electric currents are introduced here. At what point are the students learning the basics of electricity for this to be a possibility?

4Ee - Need clarification statement.

4.E.f-"in the solution" is redundant and makes the wrding more awkward

--e and f are redundant--cut one and/or combine--just add "within given design constraints" to e and drop f

4.E.g-assessment boundary doesn't seem to match PE

4.W Waves - 4.W Waves - Suggest possible changes for those performance expectations that need additional work:

4Wa - The vocabulary here requires quantitative understanding, yet 4Wb indicates qualitative understanding. A clarifying statement and/or example might be helpful in 4.W.a.

4.W.d replacing "solution to the problem of" with "a device to be used for" would make the intent more clear.

4We - This should probably specify physical model to distinguish this from other types of models if that is what is intended. use "how" rather than "that"

5.SPM Structures, Properties and Interactions of Matter - 5.SPM Structures, Properties and Interactions of Matter - Suggest possible changes for those performance expectations that need additional work:
The mathematics of comparison would be enhanced by including density within DCI as a comparison.
5SPMa - The standard is vague - see the comment on the DCI for this standard - a bit more information about types of properties to be measured and measurement outcomes would be helpful. There is no clear connection to time due to the vaugeness, also need to consider density.
5.SPM.b--awkward wording--suggestion: Plan and carry out investigations that mix two or more substances and determine whether or not a new substances with new properties was formed.

WARNING!--5.SPM.c-An assessment boundary is necessary here--although we are not yet distinguishing between mass and weight, to use weight here is actually incorrect if a gas is produced that is lighter than air--this will have mass, but not weight due to the upward bouyant force;m the statement in the PE is ONLY true if the gas is heavier than air--either change PE to mass, or simply limit to reactions that do not produce gas lighter than air. In order to not add in the weight/mass difference here an assesment boundary is needed and the clarification statement should be changed to reflect why this assessment boundary is necessary

5.MEOE Matter and Energy in Organisms and Ecosystems - 5.MEOE Matter and Energy in Organisms and Ecosystems - Suggest possible changes for those performance expectations that need additional work:

5.MEOE.b--Clarification statement--"Models should demonstrate that matter from one organism can..."

5.MEOE.c--Use models to demonstrate (display?) the energy that animals expend to move and generate body warmth can be traced back to the sun as its source.

5.MEOE.d--"in ecosystems" is unecessary

5.ESP Earth's Surface Processes - 5.ESP Earth's Surface Processes - Suggest possible changes for those performance expectations that need additional work:
ESPa still needs more clarification other than just listing the earth's systems; Suggestion: Identify the limitations of models that describe the interactions among Earth's systems. (to identify the limitations, they will have to understand the interactions)

ESPe is too high for elementary students as written unless the designs could be ""science fiction"" type and disregard cost, material, etc limitations

It is obvious that life, physical, earth/space science are addressed at each grade level. It is not readily clear how one set of PEs in a topic connect with another set of PEs in a different topic. Tools for discerning these connections would be helpful.

5.SS Space Systems: Stars and the Solar System - 5.SS Space Systems: Stars and the Solar System - Suggest possible changes for those performance expectations that need additional work:
This seems to be a quantum leap from the level that is addressed at first grade. Also, elementary needs to continue to push some opinion points for upper elementary. CCSS focuses on opinion at elementary as a precursor to argumentation. 5.SS.b addresses argumentation, but in this case the content of the argument is too difficult for grade 5.

5.SS.e is much more appropriate for PS4.b than 5.SS.a.
Wish there had been more at the lower grade levels leading up to this
Much of this standard only requires stating the facts - that is these could be looked up using Google. This one should be reworked to provide a performance that utilizes the knowledge rather than the knowledge being the sole piece of action. The PEs taken as a whole, while reflecting the knowledge that we would like, it is not as clear that these will lead to understanding.
many of the earth/space topics flow well thru the elementary, building on each year. Space is the exception. It starts in 1st grade, nothing else is mentioned till 5th grade, then there is a big leap from this content to the MS content."

MS.SPM Structure and Properties of Matter - MS.SPM Structure and Properties of Matter - Suggest possible changes for those performance expectations that need additional work:

MS.SPM.a--with varying complexity is not needed in the PE since it is in the the clarifying statement; crystals should be identified as "extended structures in the clarification statement

MS.SPM.b--comes across as cookie cutter lab; suggestion: Plan and carry out an investigation that will evaluate the claim that one pure substance can be distinguished from another pure substance based on their characteristic properties; would leave off methane, propane, hydrogen, and oxygen as they would be difficult to actually test (and not just look up information about).

MS.SPM.c--unecessarily complicated; suggestion: Manipulate simulations of the speed and position of atoms in solids, liquids and gases to determine the effect of adding thermal energy to the system.

MS.CR Chemical Reactions - MS.CR Chemical Reactions - Suggest possible changes for those performance expectations that need additional work:

MSCRa - Balancing equations seems to be a natural place to start during this stage. Simple reactions can be studied. It also introduces/reinforces the concepts of conservation. Maybe: Using atomic masses is beyond the scope of this performance expectation. Knowledge of chemical symbols and balancing more than the most basic equations are beyond the scope of this performance expectation.

MSCR.c- word choice of "investigate" does not direct the use of an engineer design cycle. Suggestion for change: Design a system which uses various fuel sources to deliver a specified amount of energy (in quantitative terms).

MSCRd - the PE is vague making it difficult to determine what the appropriateness of the PE. The PE should be rewritten or the clarification statement should be expanded. There is an overall tendency in the MS area of physical science to focus on standard and common demonstrations. It appears at times that the authors had a demonstration or investigation that is considered critical and a PE is designed to be sure and do the the demonstration. This is problematic. The PE should force us out of our box and not be a rehash of what we currently do... There is a need to expand the clarifications

MS.FM Forces and Motion - MS.FM Forces and Motion - Suggest possible changes for those performance expectations that need additional work:

FM.a. Seems to start in the middle of the design cycle.

What is the idea of Engineering Design? This should be a process, not a thing (which is, at first glance, what these are)

Investigate vs. design – engineers don't investigate (or do they?) vs. scientists do more investigation

FMb - again, the vague nature of this makes it difficult to determine appropriateness; the design process would better be directed by including the need for students to propose the next iteration of the design based upon data related to a specific criterion, Suggestion for change: Analyze data from different design solutions to propose an improvement to the design given a specific criteria related to the acceleration of an object.

FMc - Here is a place that does ask for quantitative information. Good - but not in alignment with the qualitative asked for in other sections of MS. The other areas need to ramp up to the quantitative analysis - ie mathematical thinking such as here.

FM.d.-PE specifies manufacturing process but the Clarification Statement only mentions a lump of clay which is more like a science experiment. Suggestions for change: Provide some clarification statements that direct the audience to a manufacturing process, such as constructing a support for building or object that has to support a large amount of weight, which shape (circular, rectangle, triangle, etc) provides the greatest support with the least amount of building material?"

FMf - There is a need for further clarification. At this stage it appears as if the tried and true demonstrations run the show rather than the PE defining the content."

MS.IF Interactions and Forces - MS.IF Interactions and Forces - Suggest possible changes for those performance expectations that need additional work:

"IFa - Need for further examples in the clarification. Again - is it the demonstrations run the PE or the PE determining the demonstrations. Core idea of ETS1.C is not met by this PE because students are not making a modification of an iteration of a design and then testing that new prototype. Choice of the word “investigate” does not adequately guide teachers to the engineering goals of this PE. As written, the PE is awkward and not helpful for teachers because it is trying to stay vague to not limit curriculum choices but as written does not provide enough guidance. Suggestion for change: Design an improvement for a device which uses an electromagnet. Clarification Statement: Suggestions for design improvements should be based upon systematically gathered data….

IFb - Why limit the universal law of gravitation. At least as a mathematical thinking tool it gives meaning to the suggested clarifications"

Add the concept of collaboration with the planning and carrying out. While collaboration may be understood in the terminology, some feel as though it should be stated specifically.

MS.E Energy - MS.E Energy - Suggest possible changes for those performance expectations that need additional work:

E.a.- Core idea of ETS1.A. is not met by this PE because students are not directly involved in evaluating a design option based upon criteria or constraints. Students need to be involved with comparing specific design choices to specified constraints in order to evaluate whether that design choice will be acceptable or if they need to suggest a different design in order to satisfy a given constraint. Suggestion for change: Design a traffic pattern and set of speed limits for a given setting which takes into account the kinetic energy of various vehicles in the traffic pattern.

E.f.- This PE is well written as an engineering design PE. However, the Clarification Statements do not guide teachers to viable design items that can be constructed and evaluated by middle school students. Suggestions for change: Clarification Statement – Solutions can include use of lubricant on an axle for a wheel, etc. Everyday machines or systems such as wheels on toy cars, insulating cups, heat sinks on computers, etc… Solutions should focus on the use of various materials based upon the properties of those materials. There need to be further examples to support the the use of advances in technology. As now done, this is not addressed well or clear how one would do this.

"Some felt the math was not as explicit as it could be. For example, math isn't stated that it is used to analyze data. Teachers are required to access the math standards to teach the science standards. Perhaps it would be easier to specifically state the math standard to make it more user friendly (or hyperlink). Math terminology ""linear relationships, analyzing data, simple functions" is acceptable as long as it's understood a 6th grader might have a different level of understanding than an 8th grader. Some want the engineering design process stated in a clear manner. Also, the concept of reverse engineering design (taking things apart) was suggested as a step before the engineering step. Needs to be cross referenced with the common core standards. Doesn't speak to the common core standards for math, what it speaks to is the mathematical practices and that is not giving teachers specific clues about what should be taught. Terminology needs to be more specific and consistent across the subjects.

MS.WER Waves and Electromagnetic Radiation - MS.WER Waves and Electromagnetic Radiation - Suggest possible changes for those performance expectations that need additional work:
Overall - needs to be more quantitative.

The concept of "fields" should be introduced here. For example, amateur radio information to reinforce the notion of fields. Computers access and send information through radio waves. Magnetic and electric fields should be made stronger.

WER.c.- This PE does address the DCI of PS4.C but does NOT address adequately the ETS1.C. of communicating the optimization of a design. Also, this PE as written is awkward in its connection to Nature of Science. Suggestion for Change: Select the best design of a human occupied structure that maximizes or minimizes the amount of wireless communications which can occur inside the structure. Clarification Statement: Students should communicate specific features of their chosen design and why those features made the design more successful than the other options.

MS.SFIP Structure, Function and Information Processing - MS.SFIP Structure, Function and Information Processing - Suggest possible changes for those performance expectations that need additional work:

MS.SFIP.a "Discuss" is superfluous...only evaluate is needed

MS.SFIP.b not sure how you design an experiment to demonstrate that organisms survive by "having an environment in which to live" Suggestion for change: Plan and carry out investigations to generate evidence about what organisms need to survive. [Clarification statment: Experiments should be designed so that things such as obtaining food and water, disposing of waste, or charateristics of the required envoronment for survival are determined.]

MS.SFIP.c: This is too vague to guide assessment--what should students be using to construct an explanation--this sounds very much like students should have all of the functions of organelles memorized and be able to explain what they are on an assessment. Either re-wording, a clarification statement, or an assessment boundary is needed.

MS.SFIP.d: "about how" rather than "for how" also needed here is the clarification that the students are communicating not just how the technology has revealed information, but what information was revealed

MS.SFIP.f: this seems to beyond the knowledge needed for all high school students--sure it would be great if everyone knew this, but the steps necessary to get to this content will require a significant chunk of class time.

MS.GDRO Growth, Development and Reproduction of Organisms - MS.GDRO Growth, Development and Reproduction of Organisms - Suggest possible changes for those performance expectations that need additional work:

MS.GDRO.a- this seems more like an argument than an explanation. Students are asked to make a claim as to whether or not a similarity between parent and offspring is due to environmental or genetic causes (or both) and then support this claim with evidence.

MS.GDRO.b--don't need generate and collect--generate is sufficient

MS.GDRO.c--it seems like saying that asexual reproduction results in identical individuals is an unnecessary oversimplification that doesn't acknowledge what we now know about epigenetics; should be sufficient to compare them in more relative terms--significantly more or less similar

MS.GDRO.d--specialized plant structures is too vague--a clarification and perhaps assessment boundary statement are needed

MS.GDRO.e--supporting a claim, not an argument--the argument is the connection between the evidence and the claim

MS.GDRO--value neutral "changed" would be better than "improved"

MS.GDRO.h - needs clarification.

MS.MEOE Matter and Energy in Organisms and Ecosystems - MS.MEOE Matter and Energy in Organisms and Ecosystems - Suggest possible changes for those performance expectations that need additional work:
When discussing models there was a question about clarification of what type of modeling is being implied. It's not necessarily that a particular type of model needs to specified, but different levels of cognitive depth are connected to different types of models and their use--clarifications need to be carefully worded whenever "create models" or "use models" to indicate that multiple models are possible, but should only go to to this depth.
MS.MEOE.a-really two separate explanations-- add "both" after "in"
MEOE.b.-The PE does not use language that suggest an engineering focus. Choice of the word “investigate” does not adequately guide teachers to the engineering goal of this PE. As written there are no engineering DCI’s specified for any of the MEOE PE’s. This PE may not be the best for attempting to integrate engineering practices. Suggestion for change: Design a composting system (for a home or school) which incorporates characteristics from a given ecosystem’s method for cycling matter. Clarification Statement: Design plan must include discussions about the flow of energy and the conservation of matter in both the composting system and the ecosystem from which the composting system was designed.
MEOE.f.- As written there are no engineering DCI’s specified for any of the MEOE PE’s. In addition, the choice of the words, “Use evidence to support arguments…” does not direct teachers to an engineering focus for this PE. Suggestion for change: Use a multi-variable simulation to design a resource management plan to sustain or drive to extinction a member of an ecosystem in a specified amount “cycles” of that ecosystem.
MEOE.g.- As written there are no engineering DCI’s specified for any of the MEOE PE’s. This PE’s language does not direct teachers to an engineering practice. Suggestion for change: Design a monitoring system for an ecosystem which addresses the type of data as well as the number of sensors required to adequately gather sufficient evidence to understand how to stabilize a target population within that ecosystem. Clarification statement: Designs should include a rationale for why specific data is essential for the specific monitoring challenge as well as a rationale for the number of data samples needed for the scale of the system under investigation."

MS.IRE Interdependent Relationships in Ecosystems - MS.IRE Interdependent Relationships in Ecosystems - Suggest possible changes for those performance expectations that need additional work:

When discussing models there was a question about clarification of what type of modeling is being implied i.e. 3-D, paper pencil, etc. Some individuals indicated a need to make the integration seamless and more coherent. There was a recommendation to Add SEP "pose model" in rather than "use model" for this PE.

MS.IRE.c-Ask questions that could be used to refine... the questions don't refine the model, researching the answers to the questions refines the model

MS.IRE.d. - As written this PE does not focus on an engineering perspective. This PE does address the DCI LS4.D. on biodiversity but does NOT address ETS1.B. on developoing possible solutions.

MS.IRE.d and IRE.e. can be combined into one PE. Suggestion for change: Use a multi-variable simulation to design an animal management plan to sustain a healthy ecosystem as defined by specific criteria and constraints. Clarification Statement: criteria should include both social and economic considerations.

MS.IRE.f-Ask questions with the intent of clarifying (...asking the questions doesn't clarify)

MS.IRE.g Our preference is that argumentation in NGSS focus on claims that can be supported by empirical data. The claim here--that science can't answer all aspects of a question is one that can be supported, but not primarily by empirical data. This PE sounds more like arguing than argumentation in a scientific context. Rather than engaging in argument about the limitations of science, we would rather focus on a core idea in this topic and have people develop an argument that utilizes empirical data AND social or economic arguments. Suggestion: Distinguish between scientific, economic, and social arguments while engaging in argument from evidence about the stability of a given natural environment. As it is, this PE is a forced connection to NOS.

In general, the phrase "Engage in arguments from evidence..." is problematic in that it invokes arguing. It should be either "Engage in Argumentation (or maybe argument--singular)" or engage WITH arguments--arguments is a noun in this discussion, not a verb.

MS.NSA Natural Selection and Adaptations - MS.NSA Natural Selection and Adaptations - Suggest possible changes for those performance expectations that need additional work:

MS.NSA.a-Suggestion for change--Anayze data from the fossil record to determine the major patterns in the history of life on earth. [Clarification statement: The intent is not to memorize a timeline, but to analyze a set of data and recognize patterns such as cycles of mass extinctions. or simple before complex.]

MS.NSA.c- a re-write here could highlight the NOS by including an evaluation of explanations for scientific validity

MS.NSA.e-Sounds a lot like...repeat after me (in your own words)

MS.NSA.f-if there is just one model intended, it should be stated--if there really are multiple types of models that work here, leaving it more vague is ok

MS.NSA.g Seems this PE would fit better under Natural Selection and Evolution, since adaptation is secondary to reproductive isolation in this example.

a and h are redundant.

MS.SS Space Systems - MS.SS Space Systems - Suggest possible changes for those performance expectations that need additional work:

SS.c - nothing in this PE that addresses galaxies--doesn't match with foundation box (maybe c and d are switched in the foundation box?)

SS.d - PE Goes way beyond just the gravitational force that holds the SS together. That's ok, but its way deeper than the DCI

SS.e - PE is only understandable because of the clarification statement. Looks like they are trying to say "start to introduce BBT" with an attempt to spur teachers to reach for a connection to engineering. That's fine, but the PE is not well done. The NOS is a good fit here, but wording needs to be changed--either it is looking at the limitations of science in asking and answering questions to natural systems in the context of the origin of the universe, or it is trying to make sure students know about specific pieces of evidence

MS.HE History of Earth - MS.HE History of Earth - Suggest possible changes for those performance expectations that need additional work:

MS.HE.a-unecessarily complex sentence structure; it is not at all clear what students would be expected to know/be able to do. It is not clear what is added here that goes beyond what is expected in c, d, and e Clarification statements a very helpful to make them grade appropriate.

MS.EIP Earth's Interior Processes - MS.EIP Earth's Interior Processes - Suggest possible changes for those performance expectations that need additional work:

"plate" needs a modifier as these PEs need to stand independent of the topic--continental plates? plates of the earth's crust? tectonic plates? something

EIP.c the clarification statement is very specific.

EIP.d the PE seems to include a level of chemistry that MS students may not have had yet; clarifcation statement only really addresses physical processes

a and f are closely related--if both are needed, it would be helpful to either combine, or list together and more carefully distinguish between them

MS.ESP Earth's Surface Processes - MS.ESP Earth's Surface Processes - Suggest possible changes for those performance expectations that need additional work:
ESP. b - Temperature is doable, the aspect of Salinity and Global movements of water due to salinity seems a stretch for MS; suggestion--Plan and carry out investigations to determine the effect of temperature and salinity on water and apply this knowledge to construct explanations of ocean currents.
MS.ESP.f-Evaluate and revise engineered solutions designed to mitigate the effects of natural hazards connected to geologic and hydrologic systems.

Much different expectations (much higher) from the Secondary standards as compared to the Elementary Earth standards.

MS.WC Weather and Climate - MS.WC Weather and Climate - Suggest possible changes for those performance expectations that need additional work:

"WC.b.- This PE does fine for DCI ESS2.D. but does not mesh well with the ETS1.A. because the PE does not bring out the need to define/delimit the problem prior to formulating a design solution. Suggestion for change: Design a model which illustrates the impact of Greenhouse gases on the average surface temperature of the earth's surface.

WC.f.-This PE does not have good language to promote the practices of engineering into the PE. "Analyzing" does not direct teachers to the engineering cycle. Suggestion for change: Design a weather monitoring station for a given location on earth which gathers sufficient data to more accurately predict severe weather for a specified local."

MS.HI Human Impacts - MS.HI Human Impacts - Suggest possible changes for those performance expectations that need additional work:

HI.a - if the clarification statement has to be that long, there is an issue in understanding what the PE is asking for.,,,the questions don't develop and refine, but the answers to the questions might...

HI.b.- This PE is only trying focus on the first step of the engineering design cycle which we believe is wise. We like the idea of the inclusion of the word, “solvable” problems to guide students toward evaluating if a problem is able to be address by science and engineering or not.

HI.d.- This PE as written is too long. There needs to be a discussion of the limitation of the modeling simulation but this should be in the Clarification Statements not as part of the PE. As written the PE does not provide a clear indication of the engineering design cycle. Suggestion for change: Use a multi-variable computer simulation to evaluate various industrial regulations plans for their potential ability to reduce the magnitude of changes in Earth’s mean surface temperatures.

HI.e. This PE does a nice job of incorporating the engineering idea of combining elements from various solutions to design a better system.

HI.f.- This PE’s wording does not guide readers easily to the engineering practices. Words like “read critically and evaluation” are general process skills but not unique to an engineering design cycle. Suggestion for change: Evaluate multiple proposed energy production and management plans for a community based upon a defined set of criteria which consider both renewable and non-renewable energy options.

HI.g.- This PE does a nice job of explicitly bringing in the engineering practices in the context of human impacts. This entire standard could be re-names to “Interdisciplinary Societal Challenges” better represent the need for engineered solutions to global and local problems."

There is no MS.HI.h unless I am missing something . . . .

MS.ED Engineering Design - MS.ED Engineering Design - Suggest possible changes for those performance expectations that need additional work:
"CR.c- word choice of “investigate” does not direct the use of an engineer design cycle. Suggestion for change: Design a system which uses various fuel sources to deliver a specified amount of energy (in quantitative terms).

FM.b.-the design process would better be directed by including the need for students to propose the next iteration of the design based upon data related to a specific criterion, Suggestion for change: Analyze data from different design solutions to propose an improvement to the design given a specific criteria related to the acceleration of an object.

FM.d.-PE specifies manufacturing process but the Clarification Statement only mentions a lump of clay which is more like a science experiment. Suggestions for change: Provide some clarification statements that direct the audience to a manufacturing process, such as constructing a support for building or object that has to support a large amount of weight, which shape (circular, rectangle, triangle, etc) provides the greatest support with the least amount of building material?

IF.a.- Need for further examples in the clarification. Again - is it the demonstrations run the PE or the PE determining the demonstrations. Confusing thing is that some states have really high speed limits and others have rather conservative limits - does it have to be specific to speed limits? Core idea of ETS1.C is not met by this PE because students are not making a modification of an iteration of a design and then testing that new prototype. Choice of the word “investigate” does not adequately guide teachers to the engineering goals of this PE. As written, the PE is awkward and not helpful for teachers because it is trying to stay vague to not limit curriculum choices but as written does not provide enough guidance. Suggestion for change: Design an improvement for a device which uses an electromagnet. Clarification Statement: Suggestions for design improvements should be based upon systematically gathered data…. Add the concept of collaboration with the planning and carrying out. While collaboration may be understood in the terminology, some feel as though it should be stated specifically.

E.a.- Core idea of ETS1.A. is not met by this PE because students are not directly involved in evaluating a design

HS.SPM Structure and Properties of Matter - HS.SPM Structure and Properties of Matter - Suggest possible changes for those performance expectations that need additional work:

SPMa seems to match the DCI about structure and interactions of matter better than the atomic structure statement in PS1.a. A suggestion for the PE is to evaluate various representations of single and multiple atom systems in terms of the representation's strength in the explanation of a given property of matter and the limitations of that specific representation of matter.

SPM.a.- PE suggestion for change: Evaluate various representations of single and multiple atom systems in terms of the representation's strength in the explanation of a given property of matter and the limitations of that specific representation of matter.

SPMd is not listed in the crosscutting concept column. It could fit into structure and function.

SPMh – The PE as written implies a bias toward the use of nuclear energy. This PE needs to be rewritten in a more neutral manner to assure that students examine the merit and drawbacks of all types of energy production.

DCI includes strong and weak interactions that are not explicitly included in the PE.s.

A great deal of professional development will be needed to construct or work through the data needed to teach g and h.

HS.FI Forces and Interactions - HS.FI Forces and Interactions - Suggest possible changes for those performance expectations that need additional work:

"FI.c. - in this PE the clarification statement only requires the evaluation to involve qualitative data (which is what is required at a middle school level), At the HS level, students should be challenged to evaluate both qualitative and quantitative data related to collisions.

FI.f. - this PE is attempting to incorporate the engineering design cycle however, javascript:better language should be found in the engineering community which includes such phrases as ""prototype"" for communicating the improvement of a design through numerous iterations.

Newton's second law here, third law was in MS standards but don't recall first law anywhere.

HS.E Energy - HS.E Energy - Suggest possible changes for those performance expectations that need additional work:

E.e could be clarified by adding the phrase "with its surroundings." To me, minimizing the flow in or out of the system would not affect the equilibrium within the system.

HS.WER Waves and Electromagnetic Radiation - HS.WER Waves and Electromagnetic Radiation - Suggest possible changes for those performance expectations that need additional work:
Specific Points

WERa: The clarification might include glass as a medium in alignment with DCI PS4A.

WERb: There were no CC's linked to the PE.

WERc: There were no CC's linked to the PE.

General Observations

One item to consider is the balance between looking up information vs. engaging the students in investigations. The impression for this standard was that it may lean too heavily on the former. This was also a concern with other standards in the Physical Science Section. During the next revision a close look at the balance between finding information and producing information that the students are to interpret.

It was noted that there will need to be professional development for WER d and e. A few more explicit clarifications, without being overly prescriptive, would be useful.

HS.SFIP Structure, Function and Information Processing - HS.SFIP Structure, Function and Information Processing - Suggest possible changes for those performance expectations that need additional work:
Topic title suggestion: H.S. H.S.I.P. (Structure, Function, and Information Processing) could be titled Structure, Function, and Integrated Systems. This shifts from rudimentary data information processing to integrating concepts to making relationships across multiple systems systems. Increase the infusion of biotechnology to faciliate understanding of the role of engineering design in explaining DNA, models of feedback mechanisms, and organismic behaviors. The biotechnology angle here would definitely be a way to incorporate more engineering into the Life Science area...Construct an explanation of how a given sequence of DNA would need to be changed to make the resulting protein meet specific criteria.

HS.SFIP.f -the questions don't establish the strength..."Ask questions that could be used to evaluate the strength...."

HS.IVT Inheritance and Variation of Traits - HS.IVT Inheritance and Variation of Traits - Suggest possible changes for those performance expectations that need additional work:

HS.IVT.a-Ask questions aimed at trying to determine...or...that will reveal critical information about...

HS.IVT.e-Construct an explanation and create a model" about how a chromosome is changed during meiosis should begin the statement for HS.IVT.e. This strengthens the critical imperative to compare and contrast mitosis and meiosis from a illuminating genetic variability and natural selection. Once again leaving out the processes involved in passing genetic information reduces the concept to individual facts that do not make sense out of context.

HS.IVT.f-not sure what is meant by "viable" in #2--it gives the impression that inheritable genetic information is only affected by "positive" replication errors; if it means errors that don't prevent the cell from surviving, that is not clear with this wording; could be changed to (2) inaccuracies during replication that aren't severe enough to prevent the cell's survival

HS.MEOE Matter and Energy in Organisms and Ecosystems - HS.MEOE Matter and Energy in Organisms and Ecosystems - Suggest possible changes for those performance expectations that need additional work:

HS.MEOE.b-Construct an explanation that explains how... and put "from sugar molecules produced through photosynthesis" in parentheses, or set apart with dashes

HS.MEOE.c-Use a model to explain cellular respiration as a chemical process that results in a net transfer of energy through the process of breaking of bonds in food and oxygen molecules and forming bonds in new compounds.

HS.MEOE.e - "Communicate descriptions"should be changed to "create and explain models" of the roles of photosynthesis and cellular respiration in...Communicate descriptions does not fully support demonstration of conceptual understanding.

HS.LS-MEOE.g-Ask questions that provide insights about...to...Ask questions that guide information gathering about... (the questions don't provide the insights)

HS.IRE Interdependent Relationships in Ecosystems - HS.IRE Interdependent Relationships in Ecosystems - Suggest possible changes for those performance expectations that need additional work:
LS2A - Disciplinary Core Ideas should specifically include the role of of symbiosis in maintaining or altering relationships in ecossystems.

HS.IRE.b-Using the phrase "Design solutions" makes this PE seem engineering-ish, but the rest of the PE doesn't continue to support this. Either revise so that "Design solutions is more sciencey, or ramp up the engineering to be something like...Evaluate proposals for technological solutions that will maintain or increase biodiversity of a given ecosystem based on the criteria of cost, total footprint of development and use, and potential overall effectiveness."

HS.IRE.d--In general, the phrase "Engage in arguments from evidence..." is problematic in that it invokes arguing. It should be either "Engage in Argumentation" or engage WITH arguments or Evaluate arguments—“arguments” are things in this discussion, not processes. Actually, Engage in argument isn't quite right either...Develop (or evaluate competing) an argument

HS.IRE.g-forced NOS-The mathematical comparisons aren't describing the tentative nature of science, rather the uncertainties in the models represent the attempt to quantify how tentative the proposed answer is. The clarification sttaement is a better PE.

HS.NSE Natural Selection and Evolution - HS.NSE Natural Selection and Evolution - Suggest possible changes for those performance expectations that need additional work:
Natural selection and evolution (common ancestry) are separate concepts: common ancestry is inferred from many sources of evidence (see HS.LS-NSE-e), and natural selection is ONE mechanism affecting the outcome of common ancestry. As in the MS standards, natural selection and adaptation are closely related. In short, not all natural selection results in evolution, and not all evolution results from natural selection. Natural selection is one of many mechanisms affecting evolution (common ancestry), but none of the additional ones are included in any of these statements. There is nothing on neutral evolution (genetic drift), or speciation, much less endosymbiosis, horizontal gene transfer, epigenetics – or even cladistics, which is the normal way that classification is performed these days. Combining "Natural Selection and Adaptation" (a middle school standard) makes a lot of sense, because natural selection is all about adaptation. Maybe call this Evolution through Natural Selection?

HS.NSE.d could be strengthened by incorporating mathematical modeling to communicate information describing how changes in environmental conditions affect the disctribution of traits in a population causing: 1) increases in population of some species, 2) the emergence over time of new species, and 3) the extinction of other species.

no place to evaluate HS.NSE.e.--this PE would definitely be strengthened with a clarification statement and/or assessment boundary to establish more clarity about the scope of these experiments

HS.SS Space Systems - HS.SS Space Systems - Suggest possible changes for those performance expectations that need additional work:

e, f, g extend beyond what every student needs to know by the time they graduate HS.

HS.HE History of Earth - HS.HE History of Earth - Suggest possible changes for those performance expectations that need additional work:

The overall concern that I have is that several of these PE's are great for a complete understanding of Earth Science, but not a realistic goal for what every student needs to know by the end of HS. Many of these topics are not even taught in entry level college courses.

HS.ES Earth's Systems - HS.ES Earth's Systems - Suggest possible changes for those performance expectations that need additional work:

There is no ES.f or ESS-ES.g, but they have questions in the survey.

HS.WC Weather and Climate - HS.WC Weather and Climate - Suggest possible changes for those performance expectations that need additional work:

There is much in this that is too much to expect to be learned in HS.