Washoe County School District K-5 Science
2020 Instructional Materials Evaluation Rubric
(Community Members, Administrators and Parents Form)

Category 1: Designed for Three-Dimensional Learning

Criterion 1A: Instructional materials focus on students making sense of phenomena or designing solutions to problems which drives student learning.

- A good phenomenon builds on everyday student experiences and targets grade appropriate learning goals.
- Engineering design solutions are tied to grade specific science ideas.

Specific Evidence from Materials
FOSS Motion and Matter: Anchor phenomenon for investigation #1 is a student tries to use a magnet to hold up a poem and painting to the refrigerator – the magnet can not hold up the material? This phenomenon is a great one – kids of all ages, backgrounds and experience can relate to putting something up on a refrigerator with a magnet – and if they have not – that could easily be done in a classroom setting providing the background experience to relate to the phenomenon. Activity #2 uses a skateboard scenario – one experienced starts at the top of the hill and another not so experienced starts half way down the hill. They stop at different places. Activity #3 – uses the actual activity of building carts and rolling them off the table – they fall apart – how can you engineer a stronger cart that will not fall apart. All of these phenomena are good as they do not require specialized background knowledge and all can be recreated in a classroom or playground setting. This is very well thought out to eliminate excessive background experience from children that excludes students. The engineering activity actually uses a lesson about making carts and exploring how they roll – to engineer a stronger cart – this is great in that as part of the learning sequence – the students have built the carts and now they use that info to build a stronger and better cart. They apply knowledge about forces and motion in their design – thus bringing the entire unit of instruction (Motion side) together.

To what extent do the materials support Criterion 1A? Include your reasoning.
See above

Criterion 1B: Instructional materials integrate elements of the Science and Engineering Practices, Crosscutting Concepts and Disciplinary Core Ideas.

- Students are doing science as scientists would to explain the natural and human-built world.
- Materials use an inquiry-based and problem-solving approach where students engage in the practices of science and engineering.

Specific Evidence from Materials
Foss uses a learning cycle format that uses an activity first model – Students engage in an activity and try to make sense of it. In module 1 – students explore tow forces – magnetism and gravity. Students start with simple magnet explorations (comparing two magnets and then a chain of magnets) to see that a magnet has two sides. Then students use the magnets to levitate a paperclip. Then they learn about gravity and why the force of the magnet only works at a close distance – then another force takes over – gravity. The students are led though careful investigations as a scientist would build up evidence and connect making claims that then connect to the next exploration. This is well thought out and requires student interaction and sense making to put it all together. All explorations require hands-on activities and use an inquiry-based format. This is more than structured – and moves to more guided inquiry initially and then for the engineering design moves to a full open inquiry design challenges based upon the knowledge constructed within the explorations. This is a strong and sound advancement of sense making and reasoning that is built into the structure of the modules.

To what extent do the materials support Criterion 1B? Include your reasoning.

Criterion 1C: Instructional materials help students develop increasingly sophisticated understandings within and across grade-levels.

- Materials make connections between lessons, units and grade levels.
- Students engage in learning experiences with explicit connections to other science disciplines and other subjects.

Specific Evidence from Materials
As explained above, FOSS makes the concept map and then builds inquiries that gradually support and build upon one another to meet the needs of the standards. These are built around the learning progressions in the NGSS (mostly) and are

built appropriately based upon experience and ability. I think that the fact that this kit has motion and matter is an artifact of the 3rd grade Physical Science standards and the limited breadth that is required by the standards. In this review – I am only looking at the Motion portion.

In the first three modules there is a learning progression that goes from gravity and magnetism (non-contact forces) and then explores these in module two with patterns in motion utilizing the gravitational force. Finally, this all ties together in an Engineering Challenge that uses non-contact forces and patterns in motion to build a better and stronger cart. This is further challenged with gravity and magnetism challenges that the students perform. I think FOSS does a great job at this…

To what extent do the materials support Criterion 1C? Include your reasoning.

Category 2: Instructional Supports

Criterion 2A: Instructional materials support monitoring student progress in all three dimensions.

- Multiple and varied assessments allow students to demonstrate learning in all three dimensions including application of knowledge in performance tasks.
- Formative assessments, including self and peer assessments, are embedded throughout to inform instruction.
- Assessments are unbiased and elicit direct, observable evidence from all students.
- A phenomena or problem drives tasks, and information from the task is required to complete it.
- Rubrics and scoring guidelines are provided for interpreting student performance including sample student responses

Specific Evidence from Materials
FOSS has a well thought out assessment system that include a variety of formative and summative assessments throughout the modules. In terms of formative – they have short cycle assessments (embedded and performance assessments) that inform the teacher of how students are progressing within the unit. The I-check assessment is a bit longer and checks learning every 1-2 weeks and allows or students to attach the learning into a broader context. Medium and

long cycle assessments include survey / posttest, interim benchmark assessments and portfolios check for more summative and long-term learning.

FOSS has developed assessment as a system to help teachers understand where learning occurs both formatively and combatively. This assessment system is built seamlessly within each of the kits and modules for consistency and ease of use for teachers.

In module #1 formative questions align with the phenomenon of the magnet holding up the picture on the fridge. Teachers probe with questions like: What happens when magnets interact with other magnets and paper clips or what causes change in motion. Activities lead to clear evidence that students use to answer these guiding questions that relate explicitly to the activities that the children are performing.

Phenomena drive the questions and relate back and forth to the activities.

FOSS has a well-developed set of rubrics for use within each of the modules to help teachers with both formative and summative e assessment. Each of the assessments (embedded and benchmark align to specific components of the NGSS standards within the lesson).

To what extent do the materials support Criterion 2A? Include your reasoning.
Assessment is well done throughout FOSS.

Criterion 2B: Instructional materials support equitable access to science knowledge and practice for all students.

- Students engage with direct (preferably first-hand), shared experiences that are relevant and authentic, serve as the basis for learning and meet the developmental needs of elementary students.
- Students' questions, prior experiences and diverse backgrounds related to the phenomenon or problem drive learning.
- Materials provide an opportunity to learn by allowing for the development of scientific understandings over time using multiple modalities.
- Materials provide opportunities for students to make connections to and explore the natural world outside the classroom.

Specific Evidence from Materials

FOSS uses the ABC approach to doing science. Each lesson set begins with a phenomenon and an exploration that helps to understand that phenomenon. This all relies on firsthand experience and the phenomenon is completely relatable to most students (if not – the phenomenon can be reproduced right in the classroom to get the desired background experience). These are developmentally appropriate and meet diverse background needs (Magnet holding a picture on the fridge vs Mag lev train)

All modules and activities in the modules start with the phenomenon and driving questions. These define the experiential inquiry and help students to look for evidence to help answer the guiding question and how that relates to the phenomenon. EG. Observing systems to predict motion… Guiding question – How can we change the motion of wheel and axel systems rolling down ramps. This relates directly to the skateboard phenomenon introduced in this module. This is consistently used in every module in this kit.

I think that FOSS has incredible well-developed activities that can be more structured or less structured depending on the needs of the students and the knowledge of the teacher. The materials and activities are simple enough that the teacher can easily move between levels of inquiry. The activities all relate to one another and use a variety of modalities (when the other online and physical resources offered by FOSS) are used in combination with the activities. Eg student reader, phenomenon videos, print resources etc.

I think that all the activities that I reviewed directly connect to the real world in a way that the average 3rd grader could understand and have experience with. Simply put – a magnet holding a picture on the fridge vs a mag lev train or a carnival ride – FOSS just works.

To what extent do the materials support Criterion 2B? Include your reasoning.
See above

Criterion 2C: Instructional materials support equitable access to science knowledge and practice for all students.

- Materials support student sense-making at both an individual and group level.
- Classroom discourse focuses on expressing and clarifying student reasoning with opportunities for students to share ideas and feedback with each other that supports the iterative and collaborative co-construction of explanations.
- Materials include supports for oral and written language processing to involve students in scientific discourse for sense-making including a language-in-use approach.

Specific Evidence from Materials
FOSS seems to be all about sense making. Students interact with a phenomenon and then do several activities that help to make sense of the phenomenon. Guided questions using evidence help students make connections and guiding questions drive the sense making discussions. After the activities – the actual Explanation component from FOSS has been renamed "sense Making discussions" where student interact with one another to make sense of the activities considering the phenomenon. This is done mostly in groups in FOSS, but does have individual accountability included. FOSS has developed a set of discourse tools that reflect the most recent research from the Framework and get kids talking and making sense of the phenomenon. FOSS includes teacher questions at multiple levels to prompt student discussion and student to student interactions to support group learning and discussions within the learning context. There is a full set of resources for the teacher to use to drive discourse learning within the modules. FOSS also has a well-developed system on learning language with receptive and productive language modalities. These include oral and written along with reading, writing, listening and speaking and a variety of nonverbal modalities embedded within instruction. For special use for EL – the diversity tab for each of the units has a developed plan aligning learning activity with abilities of learners and associated tasks. Vocabulary is embedded within the instruction rather than frontloaded and the emphasis is on sense making rather than command of the English language. This is a true strength of the FOSS system. This is the definition of Language in use approach.

To what extent do the materials support Criterion 2C? Include your reasoning.

Criterion 2D: Instructional materials support teacher planning and instruction.

- Materials include background knowledge in both science content and pedagogy and student preconceptions.
- Materials provide guidance to support differentiated instruction, extra support and extensions at the appropriate level for a broad range of learners.
- Materials include professional learning and additional instructional planning resources.
- Materials have supports for families to extend learning and offers suggestions for how to help their children at home.

Specific Evidence from Materials
FOSS uses an inquiry approach to learning that is advocated by the Framework for K12 Science Education. With that said the activities comes before the content, but content is built through student engagement in the activities. FOSS has a background section for teachers – to learn the content and has great resources and videos on the content and process required to teach science in this format. This is far more developed in FOSS than in any other curriculum reviewed this far. There is a section on potential student misconceptions as well. The activities are built with children of many abilities in mind – with that said – there are resources and ideas for teachers for differentiating instruction for abilities, learners, and even special abilities (including gifted students) in the online materials. This is very well developed compared to other curriculum reviewed. The online resources are plentiful at FOSS – there are teacher instructional videos about most parts of teaching the specific module or about innovative NGSS instruction. With that said, I do not know how the district can leverage professional learning about FOSS when it is adopted. However, since many teachers have used FOSS in the district – there will be less training needed for initial teaching and more focus on training could be on other portions of good science teaching using FOSS. FOSS has a complete section on family engagement and activities that can be done at home to involve the entire family. None of the other curriculum reviewed had this developed in this way. Another strength of FOSS>

To what extent do the materials support Criterion 2D? Include your reasoning.

Category 3: Student Materials

Criterion 3A: Instructional materials represent a comprehensive K-5 core program.

- Materials provide instruction that correlates to our recommended instructional minutes for science.
- Materials are available in both English and Spanish.
- Graphic organizers and templates for science notebooks are included.
- Materials have resources both in print and online.
- Multimedia supports are included such as videos, tutorials and simulations.
- Technology options are appropriate for both classroom and home use.

Specific Evidence from Materials
There are four modules in this kit. Three of them are around motion and the last one on matter. I reviewed the motion portion so that comparison can be made with the other curriculum being reviewed. FOSS Motion modules 1-3: 1. Forces (gravity and magnetic) 2. Patterns in Motion 3. Engineering design with carts using forces and patterns Each of these modules are well developed and can easily fill up the required teaching minutes that WCSD has set forth. In fact - of the curriculum reviewed – this is the only one that truly extend to deep learning of the concepts in the amount of time required at an appropriate level. Materials are in Both Spanish and English Graphic organizers abound in this system for teachers and students. Materials are in print and electronically from FOSS web Multimedia support are available on FOSS web – a large variety Technology is on the FOSS web site and well developed.

To what extent do the materials support Criterion 3A? Include your reasoning.

Criterion 3B: Instructional materials include hands-on materials and equipment that support three-dimensional learning.

- Enough materials are included to allow students to do the investigations themselves.
- Materials are of a quality that will last through many uses.
- Materials include the tools necessary to make observations and measurements and conduct investigations.

Specific Evidence from Materials
FOSS has built a system for hands-on learning in groups of about 4 students. As a heavy student activity rich curriculum – there are plenty of materials for work in

groups with multiple materials for successful group work – often enough materials for teams of 2 rather than 4 to keep students engaged in the learning.

FOSS uses more household items which have an average shelf life, but can be easily replaced. For other measuring devices and materials the quality is about average or above. Easy for a teacher to use and replace.

FOSS has common materials full of measuring devices so that traditional quantitative measure can be learned simultaneously with the activities. FOSS also uses qualitative measures frequently in observations and note taking in science notebooks.

To what extent do the materials support Criterion 3B? Include your reasoning.
See above

Criterion 3C: Instructional materials include grade-appropriate texts that support three-dimensional learning.

- A range of text types and genres, both print and online, are embedded in learning experiences.
- Texts support context-specific academic vocabulary.
- Materials reflect the diversity of our students and society in a culturally responsive manner including different genders, from many cultures and nations, both contemporary and historical.
- Materials include supports for reading comprehension for a variety of student needs including high-quality questions.

Specific Evidence from Materials
FOSS uses a broad range of genres and text types. First there is the student reader with chapters that is more of a non-fiction reader for students to learn content after conducting the activity. There are additional learning resources for students in the teachers manual and online available for students to use. This is well developed within this module. Academic vocabulary relates well the recent research (NASEM 2018) report of contextualizing vocabulary within the content learning (language in use theory). The diversity strategies are very current and reflect recent research for Els and broader diverse range of students and their learning needs. FOSS is careful to use role models that reflect the diversity within the communities and nation. With that said there was about a 60% diversity

accountability – there were more white role models than diverse one (scientists), but the student representation is better for diversity representation. FOSS has a well-developed repertoire of supports for content reading within the active learning within the modules. Online resources are plentiful with training videos and resources for self-learning and use within instruction. A high quality use of questions for students and instruction.

To what extent do the materials support Criterion 1A? Include your reasoning.
See above.

Referenced, adapted and formatted from the following documents:

Achieve, Inc. (2016). EQuIP Rubric, Version 3.0.

Achieve, Inc. (2018). Science Task Prescreen.

Achieve, Inc. (2016). Using Phenomena in NGSS-Designed Lessons and Units.

Achieve, Inc. (2017). Primary Evaluation of Essential Criteria (PEEC) for Next Generation Science Standards Instructional Materials Design.

Brennan et al. (2017) *Priority Features of NGSS-Aligned Instructional Materials: Recommendations for Publishers, Reviewers and Educators* [White paper].

BSCS (2017). Guidelines for the Evaluation of Instructional Materials in Science.

BSCS Science Learning (2018). NextGen TIME

MacDonald et al. (2020). *Design Principles for Engaging Multilingual Learners in Three-Dimensional Science* Wisconsin Center for Education Research (WCER) Working Paper No. 2020-1. https://wcer.wisc.edu/docs/working-papers/WCER_Working_Paper_No_2020_1.pdf

National Academies of Sciences, Engineering, and Medicine (NASEM) (2017). *Seeing Students Learn Science: Integrating Assessment and Instruction in the Classroom.* Washington, DC: The National Academies Press.

National Research Council (NRC) (2012). *A Framework for K-12 Science Education:*

Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press.

NGSS Lead States (2013). *Next Generation Science Standards: For States, By States.* Washington, DC: The National Academies Press.

Nolan, C. (2015). *Getting their hands dirty: Engaging learners in authentic science practices outside the classroom* (Practice Brief No. 20). STEM Teaching Tools.

Washoe County School District Needs Evaluation

Washoe County School District. (2020). Request for Instructional Material Submission RFP 2020A.