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

Category 1: Designed for Three-Dimensional Learning

Criterion 1A: Phenomena and Problems

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.

Examples of Evidence:

- ◊ Photographs of trash washed up on a beach that leads into a unit on waves in 4th grade physical science unit. (A first-hand experience, video, photograph or data set to start a learning sequence that becomes the "why" for further study grounded in everyday student experiences.)
- ◊ A bucket of water is physically explored by students and leads to exploration of properties of matter in 2nd grade.
- ◊ Garbage from the lunchroom is examined to start a unit on matter and how it changes in the 5th grade physical science unit.
- ◊ 3rd grade students explore balloons, aluminum cans, styrofoam beads, and transparent tape to make observations and generate questions about static electricity in the physical science unit, lesson 3.
- ◊ Students address the problem of communicating at a distance without sound following a study of light in the 1st grade physical science unit.

Specific Evidence from Materials
Kindergarten students look at a picture of a pinball machine, view a video, and then are told they will design a pinball machine based on what they learn about how things move (Chapter 1 Lesson 1.1). This is the design challenge that anchors the unit.

To what extent do the materials support Criterion 1A? Include your reasoning.
There is a clear design challenge for students (they must design a pinball machine using their developing understanding of forces and motion, and for those who may not know what a pinball machine is, the video is provided so that everyone can have a common, shared experience.

Criterion 1B: Integrating the Three-Dimensions

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.
- Science and engineering are not presented in a linear manner; they are messy.

Examples of Evidence:

- ◊ Students conduct an investigation, including collecting data, with balls and ramps to determine cause and effect relationships of speed and energy in unit 2 lesson 4.
- ◊ Students investigate how to make different looking waves in water and how these waves affect a floating object in the 4th grade physical science unit.
- ◊ 3rd grade students generate, test and refine solutions to keep two moving objects from touching each other by applying ideas learned about magnets in lesson 9.

Specific Evidence from Materials
Students are introduced to what engineers do in Chapter 1 through readings, such as in Lesson 1.1 & 1.4, and their ideas about what an engineer does it revisited throughout the chapters (e.g., Chapter 5, Lesson 5.2, students read about a problem that needs to be solved and learn about the engineering design process that they will use to design their pinball machine. Students conduct investigations that allow them to understand how objects move including learning the effects of "strong and gentle forces" (Chapter 2, Lesson 2.2) and how that knowledge applies to designing something that can launce a pinball. In Chapter 4, Lesson 4.2, students learning about how forces change the direction of motion and apply what they learn to designing "flippers and bumpers" in Lesson 4.3. Student activities include opportunities to ask questions about what makes pinball machines work, (e.g., Chapter 1, Lesson 1.1), apply knowledge to design solutions to components of a pinball machine (Lesson 4.3, Lesson 3.4., Lesson 3.5), and construct explanations about how forces impact our day-to-day lives (Lesson 6.1). They also analyze and interpret data related to pushes and pulls to uncover evidence related to "strong and gentle forces" (Lesson 2.2).

To what extent do the materials support Criterion 1B? Include your reasoning.
The provided materials for physical science support students in understanding the work of engineers and how they utilize the design process to solve problems, such as building a pinball machine. Student activities include opportunities to ask questions (Chapter 1, Lesson 1.1), design solutions, and construct explanations. Students are also shown through these activities that sometimes engineers have to engage in "redesign" if something does not work.

Criterion 1C: Coherence

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 with intention.

Examples of Evidence:

- ◊ 5th grade students are investigating water sources around the Earth and make connections to properties of matter in both the physical science and earth science units and prior learning about weather and climate from 3rd grade.
- ◊ Students apply ELA learning to write a set of directions for conducting an investigation in the earth science unit, lesson 6.
- ◊ Line plots are used to analyze data in unit 4 at the 3rd grade level.

Specific Evidence from Materials
Each lesson begins with a reminder of what happened in the previous lesson. For example, in lesson 5.1 students are asked to revisit what they've learned about engineers and think about what actions they've taken are related to things an engineer might do. In lesson 4.2 students are reminded that in 4.1 they learned about what makes a moving object change directions.

To what extent do the materials support Criterion 1C? Include your reasoning.
At the beginning of each lesson, students review what they learned in the previous lesson or "chapter", which provides opportunities to make connections from activity to activity and lesson to lesson within the unit; however, there is no evidence found to illustrate connections to other units in Kindergarten. Teachers are provided with connections to CCSS, but there are no clear prompts directing students to consider how "analyzing and interpreting data" is related to math, or how reading book about engineers is connected to literacy.

Category 2: Instructional Supports

Criterion 2A: Assessing the Three-Dimensions
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 teacher, 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.

Examples of Evidence:

◊ As students are engaged in a performance task, there are indicators for teachers to look for and information about possible responses and next steps. This information is embedded in the lesson.
◊ In unit 1, there are two performance assessments, peer feedback throughout, exits slips, a summative assessment, and a prewrite.
◊ Individual student learning is assessed using written work that answers the driving question of the unit. (Earth Science, p. 76)

Specific Evidence from Materials
There are embedded formative assessments that include questions and prompts to elicit ideas from students. Examples of what students could look for are also included (e.g., Slide 8, Lesson 1.2) Writing is included as a collaborative formative assessment activity in lesson 1.5, where students co-construct an explanation for how the launcher moved the pinball. Chapter 4 includes a “clipboard assessment tool” for teachers. It provides teachers with an example of what students should be capable of demonstrating on their pinball machine (e.g., launcher moved the ball). A summative assessment is provided at the end of the unit, which allows students to demonstrate their understanding orally and visually (through spoken word and through demonstrating on a pinball machine). One rubric is provided to assist with grading and two rubrics are provided to assist the teacher with instructional decisions to further support students. e

To what extent do the materials support Criterion 2A? Include your reasoning.
The are many opportunities for formative assessment that are included in the PowerPoint presentations, and teachers are provided with examples of what to look for in terms of possible student ideas. The rubrics provided on the summative assessment help to address any instructional shifts that should occur based on how students performed on the test. Also, the

summative assessment includes varied ways for students to demonstrate their understanding, both verbally and visually.

Criterion 2B: Instructional Experiences

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.

Examples of Evidence:

- ◊ Students develop physical models of a landfill as open and closed systems to observe during the 5th grade garbage unit.
- ◊ Students identify components of garbage disposal in their homes and communities which connects the phenomena that started the unit.
- ◊ Students conduct a first-hand investigation of erosion and deposition using a stream table, observe time-lapse videos of landslides, engage in a virtual investigation, read accounts earth changes by wind and record changes to the playground after a snow event in the 4th grade earth science unit.
- ◊ Students raise trout from eggs in the classroom and make observations over time as part of their study of traits in the life science unit.

Specific Evidence from Materials
Chapter 2 includes a "home investigation" where students are tasked to work with family members to find objects in the home that can be pushed or rolled easily. Prompts are provided to help students talk with their families about what they observed. Soccer, or "rugball" is used as an example for students to learn more about pushes and pulls (Lesson 1.2). Students look for objects that can move in their classroom (Lesson 1.1)

To what extent do the materials support Criterion 2B? Include your reasoning.
Most, but not all of the materials directly relate to student experiences in and out of the classroom. There is an activity that uses a soccer ball, or "rugball" and activities that help students identify objects in and out of the classroom concerning objects that move, but other activities, like looking at pictures and discussing "hidden movements", may be less related to their lived experiences or too abstract. For example, one asks them to consider a tow truck pulling a car and all the movements that would have happened to get the car where it is located.

Criterion 2C: Student Sense-Making

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.

Examples of Evidence:

- ◊ 5th grade students develop models of how scents travel that are refined over the course of a three weeks using a combination of visual and written language providing multiple opportunities to develop precise vocabulary in the physical science unit.
- ◊ 3rd grade students answer questions in their notebook individually using pictures and words to explain their initial ideas about how a magnet works and have the opportunity to revise this after discussing with a peer and the whole class in the physical science unit.
- ◊ The teacher facilitates a class discussion using a word wall where kindergarten students share observations with a shoulder partner and the whole group about the kinds of things in their homes to figure out that the things we need come from nature.
- ◊ Suggested sentence frames are included to support oral and written responses when needed with the goal of independence.

Specific Evidence from Materials
The teacher facilitates a group discussion about what engineers do, specifically how they share ideas in groups. Students work with partners to discuss “what did we do to make the pinball start to move?” Prompts are provided to students. (Lesson 1.5) Kindergarten students are introduced to vocabulary after activities where they explored the relevant ideas. Sentence frames are provided to help students construct sentences that support an understanding of cause and effect (Lesson 1.5, Lesson 3.2), and accompanying language frame cards are included in the classroom materials.

To what extent do the materials support Criterion 2C? Include your reasoning.
Activities build on one another to support students in understanding forces and motion and to apply their understanding to the design of a pinball machine. Vocabulary is introduced as students figure out ideas and supports are provided to help them use the vocabulary, such as sentence frames.

Criterion 2D: Teacher Supports

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 student(s) at home.

Examples of Evidence:

- ◊ Information prior to lessons gives teachers things to except that students may already know in unit 1 p.12 in addition to how their understandings will build.
- ◊ 1st grade students have a choice to investigate different variables related to shadows, and suggestions are included as well as extensions to do at home. (Light unit, p. 40)
- ◊ The assessments include recommendations for additional supports when students don't meet expectations. "Students may struggle to articulate that scientists look back at the data they collect to look for patterns and to draw conclusions about phenomena. One way to support them in this thinking might be to share an anecdote such as, "When I was growing up, my mom used to measure my height by marking it on the wall in the pantry. When I look back at those marks, I notice patterns, like that I grew faster between the ages of 5 and 8 than I did when I was older."" (p.14)
- ◊ Students make observations of the sky with their families, looking for patterns over time. Families are provided with background information on how to record observations and what patterns to expect.

Specific Evidence from Materials
Chapter 2 includes a "home investigation" where students are tasked to work with family members to find objects in the home that can be pushed or rolled easily. Prompts are provided to help students talk with their families about what they observed. The information given in the instructional guide provides rationale for particular activities. For example in Lesson 3.2, a rationale is provided for why teachers should use the provided sentence frames to support student learning. The rationale supports claims with relevant research (Lesson 1.1). The instructional guide provides background knowledge for teachers, particularly when it is expected that students will have difficulty with abstract ideas, such as air being an invisible force. Varied instructional supports are provided including suggestions for additional references books that teachers can use (Lesson 4.2). Teacher supports include not only planning materials, but suggestions for participant structures and how to manage those who work faster/slower than others (Lesson 5.2).

To what extent do the materials support Criterion 2D? Include your reasoning.
The provided instructional materials provide opportunities for teachers to facilitate connections between home and school (Chapter 2), and include varied information to supports teachers in implementing the lessons, such as instructional guides that include rationale for particular curriculum design choices, science content knowledge, and additional resources that can be used to support teacher and student learning.

Category 3: Student Materials

Criterion 3A: Program Design

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.
- Teacher and student materials have resources both in print and online.
- Multimedia supports are included such as videos, tutorials and simulations and when appropriate, reflect the diversity of our students and society in a culturally responsive manner including different genders and sexual orientations, from many cultures and nations, both contemporary and historical.
- Technology options are appropriate for both classroom and home use possibly including translation capabilities.

Examples of Evidence:

- ◊ There are four units, each representing nine weeks of instruction at 180 minutes a week. This is short of our recommended minutes of 240 minutes a week for 5th grade.
- ◊ There are 132 60-min lessons for the whole year. This correlates to our recommended instructional minutes of 220 minutes per week for grades K-2. (3-4 60-min lessons per week)

Specific Evidence from Materials
The kindergarten glossary includes both English & Spanish, and that same glossary is included in the student notebook. Some lessons include graphic organizers to help students draw observations during investigations, and those same organizers are included in the student workbook. Classroom sets of books are provided for student use, and include enough for 18 students to individually read.

To what extent do the materials support Criterion 3A? Include your reasoning.
Student materials reflect two languages (English and Spanish), and characters within texts and photos represent the ethnic and racial diversity of the student population. There appears to be enough class sets of books for at least 18 students.

Criterion 3B: Science Equipment

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.

Examples of Evidence:

◊ There are enough thermometers, graduated cylinders, balances, magnifying glasses and measuring tapes for a whole class to use in small groups.

◊ Everything is included to engage in the lessons except for things that would already be found in the classroom like tape and colored pencils.

Specific Evidence from Materials
There are enough tennis balls for a class with 18 students to complete the activities themselves. The materials included are those that would be necessary for the investigations, with the exception of materials typically already in classrooms; however, rubber bands are included. The majority of the materials that are provided could be used repeatedly, with the exception. There are enough materials provided for each student to create a pinball machine, but cardboard would need to be replaced each year.

To what extent do the materials support Criterion 3B? Include your reasoning.
The materials provided are enough for students to conduct investigate themselves, collaboratively, or in partners, such as having 18 tennis balls and ping pong balls. There are also enough pinball machine cardboard cutouts for students to individually design their pinball machines, however, those would need to be replaced each year. Must of the rest of the materials could be reused.

Criterion 3C: Reading Materials

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 and sexual orientations, 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.

Examples of Evidence:

- ◊ Texts include an interview of Sylvia Earle and profiles of Chien Shiung Wu and Benjamin Banneker. These highlight the connections to the science students are learning. Pictures of scientists working in the field represent the diversity of our students.
- ◊ Cultural myths about the sun and stars are included in the earth/space science unit.
- ◊ Vocabulary is highlighted in the reading that follows a concrete experience where the vocabulary is first introduced.

Specific Evidence from Materials
Texts that are provided include vocabulary that students have just learned following an activity (e.g., force and visualize in the book “Talking about Forces”. Texts embedded in the teacher materials reflect the racial and ethnic diversity of students.

To what extent do the materials support Criterion 1A? Include your reasoning.
Vocabulary is reinforced in the readings, and vocabulary words are emphasized using bold text.

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.