EQuIP Rubric for Lessons & Units: Science

Version 3.0

Introduction:

The Educators Evaluating the Quality of Instructional Products (EQuIP) Rubric for science provides criteria by which to measure the alignment and overall quality of lessons and units with respect to the Next Generation Science Standards (NGSS). The purposes of the rubric and review process are to: (1) review existing lessons and units to determine what revisions are needed; (2) provide constructive criterion-based feedback and suggestions for improvement to developers; (3) identify exemplars/models for teachers' use within and across states; and (4) to inform the development of new lessons and units.

To effectively apply this rubric, an understanding of the National Research Council's *A Framework for K–12 Science Education and the Next Generation Science Standards*, including the NGSS shifts (Appendix A of the NGSS), is needed. Unlike in the EQuIP Rubrics for mathematics and ELA, there is not a category in the science rubric for shifts. Over the course of the rubric development, writers and reviewers noted that the shifts fit naturally into the other three categories. For example, the blending of the three-dimensions, or three-dimensional learning, is addressed in each of the three categories; coherence is addressed in the first two categories; connections to the Common Core State Standards is addressed in the first category; etc. Each category includes criteria by which to evaluate the integration of engineering, when included in a lesson or unit, through practices or disciplinary core ideas. Another difference between the EQuIP Rubrics from mathematics and ELA is in the name of the categories; the rubric for science refers to them simply as *categories*, whereas the math and ELA rubrics refer to the categories as dimensions. This distinction was made because the Next Generation Science Standards already uses the term *dimensions* to refer to practices, disciplinary core ideas, and crosscutting concepts.

The architecture of the NGSS is significantly different from other sets of standards. The three dimensions, crafted into performance expectations, describe what is to be assessed following instruction and therefore are the measure of proficiency. A lesson or unit may provide opportunities for students to demonstrate performance of practices connected with their understanding of core ideas and crosscutting concepts as foundational pieces. This three-dimensional learning leads toward eventual mastery of performance expectations. In this scenario, quality materials should clearly describe or show how the lesson or unit works coherently with previous and following lessons or units to help build toward eventual mastery of performance expectations. The term *element* is used in the rubric to represent the relevant, bulleted practices, disciplinary core ideas, and crosscutting concepts that are articulated in the foundation boxes of the standards and in K–12 grade-banded progressions and the NGSS Appendices. Given the understanding that lessons and units should integrate the practices, disciplinary core ideas, and crosscutting concepts in ways that make sense instructionally and not replicate the exact integration in the performance expectations, the new term *elements* is needed to describe these smaller units of the three dimensions. Although it is unlikely that a single lesson would provide adequate opportunities for a student to demonstrate proficiency on an entire performance expectation, high-quality units are more likely to provide these opportunities to demonstrate proficiency on one or more performances expectations.

There is a recognition among educators that curriculum and instruction will need to shift with the adoption of the NGSS, but it is currently difficult to find instructional materials designed for the NGSS. The power of the rubric is in the feedback and suggestions for improvement it provides curriculum developers and the productive conversations in which educators engage while evaluating materials using the quality review process. For curriculum developers, the rubric and review process provide evidence of the quality and the degree to which the lesson or unit is designed for the NGSS. Additionally, the rubric and review process generate suggestions for improvement on how materials can be further improved and better designed to match up with the vison of the *Framework* and the NGSS.

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<u>Lessons *and* units</u> designed for the NGSS include clear and compelling evidence of the following*:*

I. NGSS 3D Design	II. NGSS Instructional Supports	III. Monitoring NGSS Student Progress
The lesson/unit is designed so students make sense of phenomena and/or design solutions to problems by engaging in student performances that integrate the three dimensions of the NGSS. A. **Explaining Phenomena/Designing Solutions**: Making sense of phenomena and/or designing solutions to a problem drive student learning. i. Student questions and prior experiences related to the phenomenon or problem motivate sense-making and/or problem solving. ii. The focus of the lesson is to support students in making sense of phenomena and/or designing solutions to problems. iii. When engineering is a learning focus, it is integrated with developing disciplinary core ideas from physical, life, and/or earth and space sciences. B. **Three Dimensions**: Builds understanding of multiple grade-appropriate elements of the science and engineering practices (SEPs), disciplinary core ideas (DCIs), and crosscutting concepts (CCCs) that are deliberately selected to aid student sense-making of phenomena and/or designing of solutions. i. Provides opportunities to *develop and use* specific elements of the SEP(s). ii. Provides opportunities to *develop and use* specific elements of the DCI(s). iii. Provides opportunities to *develop and use* specific elements of the CCC(s). C. **Integrating the Three Dimensions:** Student sense-making of phenomena and/or designing of solutions requires student performances that integrate elements of the SEPs, CCCs, and DCIs.	*The lesson/unit supports three-dimensional teaching and learning for ALL students by placing the lesson in a sequence of learning for all three dimensions and providing support for teachers to engage all students.* A. **Relevance and Authenticity**: Engages students in authentic and meaningful scenarios that reflect the practice of science and engineering as experienced in the real world. i. Students experience phenomena or design problems as directly as possible (firsthand or through media representations). ii. Includes suggestions for how to connect instruction to the students' home, neighborhood, community and/or culture as appropriate. iii. Provides opportunities for students to connect their explanation of a phenomenon and/or their design solution to a problem to questions from their own experience. B. **Student Ideas:** Provides opportunities for students to express, clarify, justify, interpret, and represent their ideas and to respond to peer and teacher feedback orally and/or in written form as appropriate. C. **Building Progressions**: Identifies and builds on students' prior learning <u>in all three dimensions</u>, including providing the following support to teachers: i. Explicitly identifying prior student learning expected for all three dimensions ii. Clearly explaining how the prior learning will be built upon D. **Scientific Accuracy**: Uses scientifically accurate and grade-appropriate scientific information, phenomena, and representations to support students' three-dimensional learning. E. **Differentiated Instruction**: Provides guidance for teachers to support differentiated instruction by including: i. Appropriate reading, writing, listening, and/or speaking alternatives (e.g., translations, picture support, graphic organizers, etc.) for students who are English language learners, have special needs, or read well below the grade level. ii. Extra support (e.g., phenomena, representations, tasks) for students who are struggling to meet the targeted expectations. iii. Extensions for students with high interest or who have already met the performance expectations to develop deeper understanding of the practices, disciplinary core ideas, and crosscutting concepts.	*The lesson/unit supports monitoring student progress in all three dimensions of the NGSS as students make sense of phenomena and/or design solutions to problems.* A. **Monitoring 3D student performances**: Elicits direct, observable evidence of three-dimensional learning; students are using practices with core ideas and crosscutting concepts to make sense of phenomena and/or to design solutions. B. **Formative:** Embeds formative assessment processes throughout that evaluate student learning to inform instruction. C. **Scoring guidance**: Includes aligned rubrics and scoring guidelines that provide guidance for interpreting student performance along the three dimensions to support teachers in (a) planning instruction and (b) providing ongoing feedback to students. D. **Unbiased tasks/items**: Assesses student proficiency using methods, vocabulary, representations, and examples that are accessible and unbiased for all students.

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Units designed for the NGSS will *also include* clear and compelling evidence of the following additional criteria:

I. NGSS 3D Design	II. NGSS Instructional Supports	III. Monitoring NGSS Student Progress
D. **Unit Coherence**: Lessons fit together to target a set of performance expectations. i. Each lesson builds on prior lessons by addressing questions raised in those lessons, cultivating new questions that build on what students figured out, or cultivating new questions from related phenomena, problems, and prior student experiences. ii. The lessons help students develop toward proficiency in a targeted set of performance expectations. E. **Multiple Science Domains**: *When appropriate*, links are made across the science domains of life science, physical science and Earth and space science. i. Disciplinary core ideas from different disciplines are used together to explain phenomena. ii. The usefulness of crosscutting concepts to make sense of phenomena or design solutions to problems *across science domains* is highlighted. F. **Math and ELA:** Provides grade-appropriate connection(s) to the Common Core State Standards in Mathematics and/or English Language Arts & Literacy in History/Social Studies, Science and Technical Subjects.	F. **Teacher Support for Unit Coherence:** Supports teachers in facilitating coherent student learning experiences over time by: i. Providing strategies for linking student engagement across lessons (e.g. cultivating new student questions at the end of a lesson in a way that leads to future lessons, helping students connect related problems and phenomena across lessons, etc.). ii. Providing strategies for ensuring student sense-making and/or problem-solving is linked to learning in all three dimensions. G. **Scaffolded differentiation over time**: Provides supports to help students engage in the practices as needed and gradually adjusts supports over time so that students are increasingly responsible for making sense of phenomena and/or designing solutions to problems.	E. **Coherent Assessment system:** Includes pre-, formative, summative, and self-assessment measures that assess three-dimensional learning. F. **Opportunity to learn**: Provides multiple opportunities for students to demonstrate performance of practices connected with their understanding of disciplinary core ideas and crosscutting concepts and receive feedback.

Using the EQuIP Rubric for Lessons & Units: Science

The first step in the review process is to become familiar with the rubric, the lesson or unit, and the practices, disciplinary core ideas, and crosscutting concepts targeted in the lesson or unit. The three categories in the rubric are: NGSS 3D Design, NGSS Instructional Supports, and Monitoring NGSS Student Progress. Each criterion within each category should be considered separately as part of the complete review process and are used to provide sufficient information for determination of overall quality of the lesson or unit.

For the purposes of using the rubric, **a lesson is defined as**: a set of instructional activities and assessments that may extend over several class periods or days; it is more than a single activity. A **unit is defined as**: a set of lessons that extend over a longer period of time. If you are reviewing a lesson, you will use only the first section of the rubric (page 2). If you are reviewing an instructional unit, you apply all of the criteria of the rubric (pages 2 and 3) across the unit. You'll notice that the definition of a "unit" is intentionally broad here. If you are reviewing instructional materials that cover more than a few days of instruction, use the full unit list of criteria.

Also important to the review process is feedback and suggestions for improvement to the developer of the resource. For this purpose, a set of response forms is included so that the reviewer can effectively provide criterion-based feedback and suggestions for improvement for each category. The response forms correspond to the criteria of the rubric. Evidence for each criterion must be identified and documented and criterion-based feedback and suggestions for improvement should be given to help improve the lesson or unit.

While it is possible for the rubric to be applied by an individual, the quality review process works best with a team of reviewers, as a collaborative process, with the individuals recording their thoughts and then discussing with other team members before finalizing their feedback and suggestions for improvement. Discussions should focus on understanding all reviewers' interpretations of the criteria and the evidence they have found. With professional learning support for the group, this process will provide higher quality feedback about the lessons and also calibrate responses across reviewers in a way that moves them toward agreement about quality with respect to the NGSS. Commentary needs to be constructive, with all lessons or units considered "works in progress." Reviewers must be respectful of team members and the resource contributor. Contributors should see the review process as an opportunity to gather feedback and suggestions for improvement rather than to advocate for their work. All feedback and suggestions for improvement should be criterion-based and have supporting evidence from the lesson or unit cited.

In order to apply the rubric with reliability and with fidelity to its intent, it is recommended that those applying the rubric to lessons and units be supported to attend EQuIP professional learning based on the EQuIP Facilitator's Guide. There is guidance within the rubric below and in the Facilitator's Guide, but application of the rubric is much more successful with the support of professional learning. It is difficult to develop proficiency at using the rubric without *at least* two days of high quality professional learning that engages participants in evaluating lessons and units.

Step 1 – Review Materials

The first step in the review process is to become familiar with the rubric and the lesson or unit that is being evaluated.

- Review the rubric and record the grade and title of the lesson or unit on the response form.
- Scan the lesson/unit to see what it's about; identify what practices, disciplinary core ideas, and crosscutting concepts are targeted; and determine how it is organized.
- Read key materials related to instruction, assessment, and teacher guidance.
- Read the definitions of "lesson" and "unit" near the top of this page and decide as a group whether you will be using the shorter list of criteria for a lesson, or the longer list of criteria that apply to a unit.

Step 2 – Apply Criteria in Category I: NGSS 3D Design

Evaluate the lesson or unit using the criteria in the first category, first individually and then as a team.

- Closely examine the lesson or unit through the "lens" of each criterion in the first category.
- For each criterion, record where you find it in the lesson/unit (the evidence) and why/how this evidence is an indicator the criterion is being met (the reasoning)
- As individuals, check the box for each criterion on the response form that indicates the degree to which evidence could be identified.
- Identify and record input on specific improvements that might be made to meet criteria or strengthen alignment.

- Look across the criteria of the category (A–C for a lesson and A–F for a unit), evaluate the degree to which they are met, and enter your 0–3 rating for Category I: NGSS 3D Design (see scale description below)
- As a team, discuss criteria for which clear and substantial evidence is found, as well as criterion-based suggestions for specific improvements that might be needed to meet criteria. As a team, enter your 0–3 rating for Dimension I: NGSS 3D Design.

*If the rubric is being used to approve or vet resources and the lesson or unit does not score at least a "2" in **Category I: NGSS 3D Designed**, the review should stop and feedback should be provided to the lesson developer(s) to guide revisions. If the rubric is being used locally for revising and building lessons, professional judgment should guide whether to continue reviewing the lesson. Categories II and III may be time consuming to evaluate if Category I has not been met and the feedback may not be useful if significant revisions are needed in Category I, but evaluating these criteria in a group may support deeper and more common understanding of the criteria in these categories and more complete feedback to the lesson developer (if they are not in the room) so that Categories II and III are more likely to be met with fewer cycles of revision.*

Step 3 – Apply Criteria in Categories II and III: Instructional Supports and Monitoring Student Progress

The third step is to evaluate the lesson or unit using the criteria in the second and third categories, first individually and then as a group.

- Closely examine the lesson or unit through the "lens" of each criterion in the second and third categories of the response form.
- For each criterion, record where you find it in the lesson/unit (the evidence) and why/how this evidence is an indicator the criterion is being met (the reasoning)
- Individually check the box for each criterion on the response form that indicates the degree to which evidence could be identified.
- Record any suggestions for improvement and then rate each category using the 0–3 rating scale in the forms below.

When working in a group, teams may choose to compare ratings after each category or delay conversation until each person has rated and recorded input for both Categories II and III. Complete consensus among team members is not required but discussion is a key component of the review process that moves the group to a better understanding of the criteria.

Step 4 – Apply an Overall Rating and Provide Summary Comments

- Review ratings for Categories I–III, adding/clarifying comments as needed.
- Write summary comments for your overall rating on your recording sheet.
- Total category ratings, reflect on the overall quality of the lesson or unit, and record the overall rating of E, E/I, R, or N.

If working in a group, individuals should record their overall rating prior to conversation.

Step 5 – Compare Overall Ratings and Recommend Next Steps

- Note the evidence cited to arrive at final ratings, summary comments and similarities and differences among raters. Recommend next steps for the lesson/unit and provide recommendations for improvement and/or ratings to developers/teachers.

Rating Scales

Rating for Category I: NGSS 3D Designed is non-negotiable and requires a rating of 2 or 3. If rating is 0 or 1 then a review for resource approval does not continue.

Rating Scale for Categories I, II, & III:

Rating scales are different for each category and can be found after each category in the rubric.

Descriptors for Categories I, II, & III:

3: **Exemplifies NGSS Quality—**meets the standard described by criteria in the category, as explained in criterion-based observations.
2: **Approaching NGSS Quality—**meets many criteria but will benefit from revision in others, as suggested in criterion-based observations.

1: **Developing toward NGSS Quality—**needs significant revision, as suggested in criterion-based observations.
0: **Not representing NGSS Quality—**does not address the criteria in the category.

Overall Rating for the Lesson/Unit:

E: Example of high quality NGSS design—High quality design for the NGSS across all three categories of the rubric; a lesson or unit with this rating will still need adjustments for a specific classroom, but the support is there to make this possible; exemplifies most criteria across Categories I, II, & III of the rubric. (total score ~8–9)
E/I: Example of high quality NGSS design if Improved—Adequate design for the NGSS, but would benefit from some improvement in one or more categories; most criteria have at least adequate evidence (total score ~6–7)
R: Revision needed—Partially designed for the NGSS, but needs significant revision in one or more categories (total ~3–5)
N: Not ready to review—Not designed for the NGSS; does not meet criteria (total 0–2)

Reviewer Name or ID: PASCO Education **Grade:** Physics **Lesson/Unit Title:** Chapter 3 – Position and Velocity

Category I: NGSS 3D Design (lessons and units): *The lesson/unit is designed so students make sense of phenomena and/or design solutions to problems by engaging in student performances that integrate the three dimensions of the NGSS.*

Lesson *and* Unit Criteria Lessons and units designed for the NGSS include clear and compelling evidence of the following:	**Specific evidence from materials** (what happened/where did it happen) **and reviewer's reasoning** (how/why is this evidence)	**Evidence of Quality?**	**Suggestions for improvement**
A. **Explaining Phenomena/Designing Solutions**: Making sense of phenomena and/or designing solutions to a problem drive student learning. i. Student questions and prior experiences related to the phenomenon or problem motivate sense-making and/or problem solving. ii. The focus of the lesson is to support students in making sense of phenomena and/or designing solutions to problems. iii. When engineering is a learning focus, it is integrated with developing disciplinary core ideas from physical, life, and/or earth and space sciences.	i: What happens when a policeman with a love for the outdoors gets a distress call from a hiker who has lost her way? **Chapter 3** i: How does GPS work? **Chapter 3** i: Is density an example of a vector or scalar quantity? **Lesson 3-1** i: Frame of Reference: Students extend the concept to a familiar situation with two cars approaching each other. **Lesson 3-2** i: Nearly everyone has heard of relativity, but not many people know what it means. There are two different forms of relativity, both proposed by Albert Einstein. **Lesson 3-3** ii: Describe an action that will take you from your seat to the classroom door without using the word "displacement." What other words or phrases mean the same thing? **Lesson 3-1** ii: the next time you are in a car, watch the speedometer and think about what it tells you. Is the reading on the speedometer different if you turn around and drive in the opposite direction at the same speed? **Lesson 3-2** ii: Consider a trip between Houston and College Station, Texas, which are about 160 km (98 mi) apart. **Lesson 3-2** ii: What is the velocity of a car during stop-and-go driving? **Lesson 3-2** ii: In the USA, gas efficiency is measured in miles per gallon. In Europe, it is measured in kilometers per liter. If a car's gas mileage is 25 mi/gal, then how many liters of gasoline would you use over a 133 km trip? **Lesson 3-3** ii: Within the next decade self-driving cars could make the leap from science fiction to dealer showrooms to people's driveways. How does a self-driving vehicle represent movements? **Lesson 3-3** iii: How does GPS work? At its heart lies a fleet of 31 satellites orbiting 20,000 km above ground—around four times as far from the center of the Earth as you. **Chapter 3** iii: Place the cart on the track and record data as you push, pull, roll, or use your hand to move the cart so that its velocity-time data matches the velocity-time match graph. **Lesson 3-2** iii: Your goal is to adjust the initial parameters, xi and v, so that the line hits both targets. **Lesson 3-2**	☐ None ☐ Inadequate ☐ Adequate ☒ Extensive	

<table>
<tr><td></td><td colspan="2">iii: In this interactive simulation, you will adjust the initial position xi and four different velocities v—for each of four time periods—of the cart so that a position vs. time graph of its motion matches graphical targets. Lesson 3-2
iii: Investigation: Within the next decade self-driving cars could make the leap from science fiction to dealer showrooms to people’s driveways. How does a self-driving vehicle represent movements? Lesson 3-3
iii: Animation: A laser cutting machine is a technology for manufacturing that uses two-dimensional coordinates. This machine is typically used to cut parts out of sheet metal. An engineer first designs a part using a computer-aided design (CAD) program and creates a file with a series of (x, y) coordinates corresponding to the cuts that need to be made. Lesson 3-3</td><td></td><td></td></tr>
<tr><td rowspan="2">B. Three Dimensions: Builds understanding of multiple grade-appropriate elements of the science and engineering practices (SEPs), disciplinary core ideas (DCIs), and crosscutting concepts (CCCs) that are deliberately selected to aid student sense-making of phenomena and/or designing of solutions.

i. Provides opportunities to develop and use specific elements of the SEP(s).</td><td>Document evidence and reasoning, and evaluate whether or not there is sufficient evidence of quality for each dimension separately</td><td>Evidence of Quality?</td><td rowspan="2">☐ None
☐ Inadequate
☐ Adequate
☒ Extensive

(All 3 dimensions must be rated at least “adequate” to mark “adequate” overall)</td><td rowspan="2"></td></tr>
<tr><td>i. i: Asking questions (for science) and defining problems (for engineering): How does GPS work? At its heart lies a fleet of 31 satellites orbiting 20,000 km above ground—around four times as far from the center of the Earth as you Chapter 3
i: Developing and using models: Place the cart on the track and record data as you push, pull, roll, or use your hand to move the cart so that its velocity-time data matches the velocity-time match graph. Lesson 3-2
i: Planning and carrying out investigations: Your goal is to adjust the initial parameters, xi and v, so that the line hits both targets. Lesson 3-2
i; Analyzing and interpreting data: In this interactive simulation, you will adjust the initial position xi and four different velocities v—for each of four time periods—of the cart so that a position vs. time graph of its motion matches graphical targets. Lesson 3-2
i: Constructing explanations (for science) and designing solutions (for engineering): Within the next decade self-driving cars could make the leap from science fiction to dealer showrooms to people’s driveways. How does a self-driving vehicle represent movements? Lesson 3-3</td><td>☐ None
☐ Inadequate
☐ Adequate
☒ Extensive</td></tr>
</table>

ii. Provides opportunities to *develop and use* specific elements of the DCI(s).	ii. ii: SP1. Obtain, evaluate, and communicate information about the relationship between distance, displacement, speed, velocity, and acceleration as functions of time. A - D **Chapter 3**	☐ None ☐ Inadequate ☐ Adequate ☒ Extensive		
iii. Provides opportunities to *develop and use* specific elements of the CCC(s). **Evidence needs to be at the *element level* of the dimensions (see rubric introduction for a description of what is meant by "element")**	iii. iii: Patterns; cause and effect; scale, proportion, and quantity; systems and system models; Place the cart on the track and record data as you push, pull, roll, or use your hand to move the cart so that its velocity-time data matches the velocity-time match graph. **Lesson 3-2** iii: Patterns; cause and effect; scale, proportion, and quantity; systems and system models; In this interactive simulation, you will adjust the initial position xi and four different velocities v—for each of four time periods—of the cart so that a position vs. time graph of its motion matches graphical targets. **Lesson 3-2** iii: Patterns; cause and effect; scale, proportion, and quantity; Your goal is to adjust the initial parameters, xi and v, so that the line hits both targets. **Lesson 3-2**	☐ None ☐ Inadequate ☐ Adequate ☒ Extensive		
C. **Integrating the Three Dimensions:** Student sense-making of phenomena and/or designing of solutions requires student performances that integrate elements of the SEPs, CCCs, and DCIs.	Patterns; cause and effect; scale, proportion, and quantity, SP1 & Developing and using models: Place the cart on the track and record data as you push, pull, roll, or use your hand to move the cart so that its velocity-time data matches the velocity-time match graph. Patterns; cause and effect; scale, proportion, and quantity, SP1 & Planning and carrying out investigations: Your goal is to adjust the initial parameters, xi and v, so that the line hits both targets. Patterns; cause and effect; scale, proportion, and quantity, SP1 & Analyzing and interpreting data: In this interactive simulation, you will adjust the initial position xi and four different velocities v—for each of four time periods—of the cart so that a position vs. time graph of its motion matches graphical targets.		☐ None ☐ Inadequate ☐ Adequate ☒ Extensive	
Rating for Category I. NGSS 3D Design—*lessons* After carefully weighing the evidence, reasoning, and suggestions for improvement, rate the degree to which there is enough evidence to support a claim that the lesson meets these criteria. ***If you are evaluating an instructional unit rather than a single lesson, continue on to evaluate criteria D-F and rate Category I overall below.***	***Lesson* Rating scale for Category I (Criteria A–C only)**: **3**: Extensive evidence to meet at least two criteria (and at least adequate evidence for the third) **2**: Adequate evidence to meet all three criteria in the category **1**: Adequate evidence to meet at least one criterion in the category, but insufficient evidence for at least one other criterion **0**: Inadequate (or no) evidence to meet any of the criteria in the category			**Circle Rating** **0 1 2 3** After rating the lesson, read below for next steps

<u>What's next if the lesson rating is less than a 2?</u>

If the rubric is being used to approve or vet resources and the lesson or unit does not score at least a "2" in ***Category I: NGSS 3D Designed****, the review should stop and feedback should be provided to the lesson developer(s) to guide revisions. If the rubric is being used locally for revising and building lessons, professional judgment should guide whether to continue reviewing the lesson. Categories II and III may be time consuming to evaluate if Category I has not been met and the feedback may not be useful if significant revisions are needed in Category I, but evaluating these criteria in a group may support deeper and more common understanding of the criteria in these categories and more complete feedback to the lesson developer (if they are not in the room) so that Categories II and III are more likely to be met with fewer cycles of revision.*

<u>What's next if the lesson rating is a 2 or 3?</u>

If you are evaluating a lesson that shows sufficient evidence of quality to warrant a rating of either a 2 or a 3 for Category I, proceed to Category II: NGSS Instructional Supports

Category I: NGSS 3D Design (additional criteria *for units only*):

If you are evaluating a lesson, it is not necessary to evaluate criteria D–F. Please enter your rating for a single lesson above (after C).

Unit Criteria A unit or longer lesson designed for the NGSS will also include clear and compelling evidence of the following:	**Specific evidence from materials and reviewers' reasoning**	**Evidence of Quality?**	**Suggestions for improvement**
D. **Unit Coherence**: Lessons fit together to target a set of performance expectations. i. Each lesson builds on prior lessons by addressing questions raised in those lessons, cultivating new questions that build on what students figured out, or cultivating new questions from related phenomena, problems, and prior student experiences. ii. The lessons help students develop toward proficiency in a targeted set of performance expectations.	Position builds to displacement builds to speed builds to velocity build to applications of velocity across multiple disciplines. **Chapter 3** Major topics are broken in to smaller lessons to build and support the development of the concepts. **Chapter 3**	☐ None ☐ Inadequate ☐ Adequate ☒ Extensive	
E. **Multiple Science Domains**: *When appropriate*, links are made across the science domains of life science, physical science and Earth and space science. i. Disciplinary core ideas from different disciplines are used together to explain phenomena. ii. The usefulness of crosscutting concepts to make sense of phenomena or design solutions to problems *across science domains* is highlighted.	i: in this unit, connections to earth and life science are not appropriate to the topic. **Chapter 3** ii: models are used across the Lesson to build the content. Graphical patterns are utilized to help develop deeper understanding. **Lesson 3-1thru 3-3** ii: scale, proportions and quantity are used to help define and relate to distances and motion over distance. **Lesson 3-1thru 3-3** ii: Scale, proportions and quantity are used to quantify speed and velocity as applied to various disciplines. **Lesson 3-1thru 3-3**	☐ None ☐ Inadequate ☐ Adequate ☒ Extensive	
F. **Math and ELA:** Provides grade-appropriate connection(s) to the Common Core State Standards in Mathematics and/or English Language Arts & Literacy in History/Social Studies, Science and Technical Subjects.	**Mathematics:** i: Reinforces Quantities N.Q: MGSE9-12.N.Q.1, MGSE9-12.N.Q.2, MGSE9-12.N.Q.3 **Lesson 3-1thru 3-3** i: Reinforces Vector and Matrix Quantities N.VM: MGSE9-12.N.VM.1, MGSE9-12.N.VM.3 **Lesson 3-1thru 3-3** i: Reinforces Seeing Structure in Expressions A.SSE: MGSE9-12.A.SSE.1, MGSE9-12.A.SSE.3 , **Lesson 3-1thru 3-3** i: Reinforces Creating Equations A.CED: MGSE9-12.A.CED.1, MGSE9-12.A.CED.2, MGSE9-12.A.CED.4 **Lesson 3-1thru 3-3** i: Reinforces Reasoning with Equations and Inequalities A.REI: MGSE9-12.A.REI.1, MGSE9-12.A.REI.2, MGSE9-12.A.REI.10, MGSE9-12.A.REI.12 **Lesson 3-1thru 3-3** **ELA:** Supports Reading Literacy RL: ELAGSE9-10RL1, **Lesson 3-1thru 3-3**	☐ None ☐ Inadequate ☐ Adequate ☒ Extensive	

	Supports Reading Information RI: ELAGSE9-10RI1, ELAGSE9-10RI2, ELAGSE9-10RI3, ELAGSE9-10RI4, ELAGSE9-10RI5, ELAGSE9-10RI10 **Lesson 3-1thru 3-3** Supports Writing W: ELAGSE9-10W6, ELAGSE9-10W7, ELAGSE9-10W9, Lesson 3-1thru 3-3 Supports Speaking and Listening SL: ELAGSE9-10SL1, ELAGSE9-10SL4, ELAGSE9-10SL5, **Lesson 3-1thru 3-3** Supports Language L: ELAGSE9-10L3 **Lesson 3-1thru 3-3** **Strategies for Language support (L):** *Students speak using grade-level content vocabulary in context to internalize new English words. **Lesson 3-2** *Speak using grade-level content vocabulary in context to build academic language proficiency. **Lesson 3-2** *Students read linguistically supported text by relating the text in the book to the identical graphics and the stories told by fellow classmates. **Lesson 3-2** *Students are asked to speak specifically about how positive and negative velocities appear on the velocity vs. time graph. **Lesson 3-2** *Students develop basic sight vocabulary: slope, velocity, velocity vs. time using clear graphical representations. **Lesson 3-2** *Students are asked to describe speeds they have experienced in the context of comparing to speeds in physics Units of m/s.		
Rating for Category I. NGSS 3D Designed—*units* After carefully weighing the evidence, reasoning, and suggestions for improvement, rate the degree to which the criteria are met across the unit.	**Unit Rating Scale for Category I (Criteria A–F):** **3**: At least adequate evidence for all of the unit criteria in the category; extensive evidence for criteria A–C **2**: At least some evidence for all unit criteria in Category I (A–F)**;** adequate evidence for criteria A–C **1**: Adequate evidence for some criteria in Category I, but inadequate/no evidence for at least one criterion A–C **0**: Inadequate (or no) evidence to meet any criteria in Category I (A–F)		**Circle Rating** **0 1 2 3**

*If the rubric is being used to approve or vet resources and the unit does not score at least a "2" overall in **Category I: NGSS 3D Design**, the review should stop here and feedback should be provided to the unit developer(s) to guide revisions. If the rubric is being used locally for revising and building units, professional judgment should be used on whether or not to continue reviewing the unit. For example, a unit that is weak in one aspect of criterion A, but that the reviewers think is easy to fix, might warrant continued review to provide more complete feedback to the unit developer(s).*

Category II: NGSS Instructional Supports (lessons and units): *The lesson/unit supports three-dimensional teaching and learning for ALL students by placing the lesson in a sequence of learning for all three dimensions and providing support for teachers to engage all students.*

Lesson *and* Unit Criteria Lessons and units designed for the NGSS include clear and compelling evidence of the following:	**Specific evidence from materials and reviewers' reasoning**	**Evidence of Quality?**	**Suggestions for improvement**
A. **Relevance and Authenticity**: Engages students in authentic and meaningful scenarios that reflect the practice of science and engineering as experienced in the real world. i. Students experience phenomena or design problems as directly as possible (firsthand or through media representations). ii. Includes suggestions for how to connect instruction to the students' home, neighborhood, community and/or culture as appropriate. iii. Provides opportunities for students to connect their explanation of a phenomenon and/or their design solution to a problem to questions from their own experience.	i: Chapter 3 uses graphs, Animations and simulations to present phenomena and design problems for investigation. **Chapter 3** i: For example: In this interactive element, you create a series of individual displacements and then run the simulation to create the total displacement. This simulation is entirely in one dimension. **Lesson 3-1** ii: Students speak using grade-level content vocabulary in context to internalize new English words. Students are asked to describe speeds they have experienced in the context of comparing to speeds in physics Units of m/s. **Lesson 3-2** ii: Physics uses specific meanings for words that may be used differently in conversation. You may be familiar with the following physics terms through things you learned before or from your own, everyday experiences. Below are different ways of describing each term in everyday usage. **Lesson 3-2** ii: Within the next decade self-driving cars could make the leap from science fiction to dealer showrooms to people's driveways. How does a self-driving vehicle represent movements? **Lesson 3-1** ii: Using maps to recognize location, distance and displacement **Lesson 3-1** iii: Unit Review: A student is biking to school. She travels 0.7 km north, then realizes something has fallen out of her bag. iii: Nearly everyone has heard of relativity, but not many people know what it means. There are two different forms of relativity, both proposed by Albert Einstein. **Lesson 3-3** iii: For example, suppose a car is traveling 30 miles per hour. How long does it take the car to cross an intersection that is 18 meters across? **Lesson 3-3** iii: The two bicycles are 500 m apart at the start, which is t = 0. To use this information, we need to relate it to the distance variables we defined. **Lesson 3-3** iii: Use the word position in a sentence describing an experience you had. You must use the word so that its meaning is similar to what position means in physics. **Lesson 3-2**	☐ None ☐ Inadequate ☐ Adequate ☒ Extensive	

	iii: Next time you are in a car, watch the speedometer and think about what it tells you. Is the reading on the speedometer different if you turn around and drive in the opposite direction at the same speed? **Lesson 3-2** iii: A student starts at the origin and ends up at a position 500 m north of the origin. She knows she walked 250 m straight west, but then she was blindfolded and led to the final position. **Lesson 3-1** iii: Where are you? Where are you going? How fast? These are questions that are addressed quantitatively in physics using position, coordinates, displacement, speed, and velocity. **Chapter 3 overview**		
B. **Student Ideas:** Provides opportunities for students to express, clarify, justify, interpret, and represent their ideas and respond to peer and teacher feedback orally and/or in written form as appropriate.	Students describe and analyze motion in one dimension using equations with the concepts of distance **Lesson 3-1** Students identify positive and negative velocities on a velocity vs. time graph **Lesson 3-2** Students graph constant velocity motion as a horizontal line on a velocity vs. time graph. The vertical axis represents velocity, not position **Lesson 3-2**	☐ None ☐ Inadequate ☐ Adequate ☒ Extensive	
C. **Building Progressions**: Identifies and builds on students' prior learning <u>in all three dimensions</u>, including providing the following support to teachers: i. Explicitly identifying prior student learning expected for all three dimensions ii. Clearly explaining how the prior learning will be built upon.	i: This lesson begins a unit on position and velocity. No specific concepts are required prior to this lesson. **Lesson 3-1** i: Students should be familiar with the concepts of distance and displacement, and the difference between a scalar and a vector quantity. **Lesson 3-2** i: This lesson expands on prior teaching related to solving physics problems. Students should be familiar with the four-step problem solving process introduced previously in Chapter 2. **Lesson 3-3** i: Cross cutting concepts highlighted: The selection of a coordinate system determines the sign of position and velocity vectors in a model of one-dimensional motion. **Lesson 3-2** i: Cross cutting concepts highlighted: The behavior of physical systems can be modeled using algebraic expressions. **Lesson 3-3** ii: Lesson slide presentations delineate the development of content based on prior lessons. For example in Lesson 3: The presentation provides guided practice in using the four-step method to solve harder multi-step physics problems. Introduce students to the assumptions that can generally be made when solving physics problems. This may	☐ None ☐ Inadequate ☒ Adequate ☐ Extensive	No discussion on the engineering practices and prior practices necessary for success

	be the first time students utilize multiple, independent equations to solve for multiple unknown variables. Students brainstorm with a partner about the proportional relationships that can be used to solve a problem and the strategies that might be useful. As there are multiple variables, it is important to distinguish between the general form of the equations and forms specific to this problem. **Lesson 3-3**		
D. **Scientific Accuracy**: Uses scientifically accurate and grade-appropriate scientific information, phenomena, and representations to support students' three-dimensional learning.	Facts and vocabulary have been checked. All resources are relevant and current **Chapter 3**	☐ None ☐ Inadequate ☐ Adequate ☒ Extensive	
E. **Differentiated Instruction**: Provides guidance for teachers to support differentiated instruction by including: i. Appropriate reading, writing, listening, and/or speaking alternatives (e.g., translations, picture support, graphic organizers, etc.) for students who are English language learners, have special needs, or read well below the grade level. ii. Extra support (e.g., phenomena, representations, tasks) for students who are struggling to meet the targeted expectations. iii. Extensions for students with high interest or who have already met the performance expectations to develop deeper understanding of the practices, disciplinary core ideas, and crosscutting concepts.	i: Learn new language structures used routinely in written classroom materials. In the context of physics, mathematics is a language of describing quantitative relationships. Much research shows that the language-based approach is an effective way to both learn and teach math. Throughout this course we ask students to translate back and forth between the language of symbols and English sentences with the same meaning. For those students who are not native English speakers, the language of math is the same in all languages. If they understand the meaning of an equation, its translation into English is a strong learning modality. **Chapter 3** i: Students speak using grade-level content vocabulary in context to internalize new English words. Students are asked to describe speeds they have experienced in the context of comparing to speeds in physics Units of m/s. **Lesson 3-2** i: Students must act out and describe combinations of positive and negative position and positive and negative velocity. **Lesson 3-2** i: Students read linguistically supported text by relating the text in the book to the identical graphics and the stories told by fellow classmates. **Lesson 3-2** i: Students are asked to speak and describe the representation of a place in space at a point in time on the position vs. time graph. The	☐ None ☐ Inadequate ☐ Adequate ☒ Extensive	

	lesson moves on and students are asked to speak about how movement forward and backward appear on this graph. **Lesson 3-2** i: Students develop basic sight vocabulary: slope, velocity, velocity vs. time using clear graphical representations. **Lesson 3-2** i: In this interactive simulation, you will adjust the initial position xi and four different velocities v—for each of four time periods—of the cart so that a position vs. time graph of its motion matches graphical targets. Chapter 3 Investigation i: Vocabulary words **Lessons 3-1 thru 3-3** i: Text is provided as verbal - auditory - reading when prompted via the reading icon **Lessons 3-1 thru 3-3** ii: interactive equations **Lessons 3-1 thru 3-3** ii: Assistance: Sample problems **Lesson 3-2, 3-3** ii: In this interactive simulation, you will adjust the initial position xi and four different velocities v—for each of four time periods—of the cart so that a position vs. time graph of its motion matches graphical targets. Chapter 3 Investigation iii: Extension: Slope in math and physics **Lesson 3-2** iii: Extension: speedometers and Odometers **Lesson 3-2** iii: Extension: Varying the instantaneous velocity **Lesson 3-2** iii: Einstein and his Experiments **Lesson 3-3**		
Rating for Category II: Instructional Supports—lessons After carefully weighing the evidence, reasoning, and suggestions for improvement, rate the degree to which the lesson met this category. ***If you are evaluating an instructional unit rather than a single lesson, continue on to evaluate criteria F–G and rate Category II overall below.***	**Lesson Rating scale for Category II (Criteria A-E only):** **3**: At least adequate evidence for all criteria in the category; extensive evidence for at least one criterion **2**: Some evidence for all criteria in the category and adequate evidence for at least four criteria, including A **1**: Adequate evidence of quality for at least two criteria in the category **0**: Adequate evidence of quality for no more than one criterion in the category		**Circle Rating** **0 1 2 3**

Category II: NGSS Instructional Supports (additional criteria *for units only*)

If you are evaluating a lesson, it is not necessary to evaluate criteria F–G. Please enter your rating for a lesson above (after E).

Unit Criteria A unit or longer lesson designed for the NGSS will also include clear and compelling evidence of the following:	**Specific evidence from materials and reviewers' reasoning**	**Evidence of Quality?**	**Suggestions for improvement**
F. **Teacher Support for Unit Coherence:** Supports teachers in facilitating coherent student learning experiences over time by: i. Providing strategies for linking student engagement across lessons (e.g. cultivating new student questions at the end of a lesson in a way that leads to future lessons, helping students connect related problems and phenomena across lessons, etc.). ii. Providing strategies for ensuring student sense-making and/or problem-solving is linked to learning in all three dimensions.	i: Prior lesson knowledge is emphasized in the lesson plan document. Example: This lesson expands on prior teaching related to solving physics problems. Students should be familiar with the four-step problem solving process introduced previously in Chapter 2. **Lesson 3-3** i: Strategies to connect content provided: Example: The student is expected to: express and interpret relationships symbolically in accordance with accepted theories to make predictions and solve problems mathematically. **Lesson 3-3** i: leads to increased level of complexity: Example: Solving harder physics problems assignment Encourage students to complete the assignment sheet independently and then discuss their answers with a partner. Student pairs could volunteer to put solutions on the board. **Lesson 3-3** ii: interactive simulations allow students to work within the content, recognizing patterns, and applying engineering principles of collecting and recognizing data. For example: In this interactive simulation, you will adjust the initial position xi and velocity v of a cart so that a position vs. time graph of its motion matches graphical targets. **Lesson 3-2**	☐ None ☐ Inadequate ☒ Adequate ☐ Extensive	Could use some additional introduction concepts for the next unit and emphasizing the content developed in prior lessons and units The three dimensions are clearly in the lesson and planning tools. However, these strategies should be highlighted in the lesson plan. Teachers should be allowed to recognize the application of three dimensions within the lesson plan document

G. **Scaffolded differentiation over time:** Provides supports to help students engage in the practices as needed and gradually adjusts supports over time so that students are increasingly responsible for making sense of phenomena and/or designing solutions to problems.	Problem complexity develops as the unit progresses. For example, Lesson 1 focusses on recall and comprehension(lower level Bloom's Taxonomy). However, by Lesson 3, students are asked to comprehend, and apply their knowledge to new situations. This is a higher level of Bloom's . Student ability increases from low level Bloom's to Higher level Bloom's within the Unit with additional opportunities to extend learning.	☐ None ☐ Inadequate ☒ Adequate ☐ Extensive	This is not made clear in the lesson plan. The scaffolding is part of the construction of the unit but is not clear in the presentation to students or teachers. This would be a required topic for training.
Rating for Category II: NGSS Instructional Supports—*units* After carefully weighing the evidence, reasoning, and suggestions for improvement, rate the degree to which the criteria are met across the unit.	***Unit* rating scale for Category II (Criteria A-G):** **3**: At least adequate evidence for all criteria in the category; extensive evidence for at least two criteria **2**: Some evidence for all criteria in the category and adequate evidence for at least five criteria, including A **1**: Adequate evidence for at least three criteria in the category **0**: Adequate evidence for no more than two criteria in the category		**Circle Rating** **0 1 2 3**

Category III: Monitoring NGSS Student Progress (lessons and units) *The lesson/unit supports monitoring student progress in all three dimensions of the NGSS as students make sense of phenomena and/or design solutions to problems.*

Lesson and Unit Criteria Lessons and units designed for the NGSS include clear and compelling evidence of the following:	**Specific evidence from materials and reviewers' reasoning**	**Evidence of Quality?**	**Suggestions for improvement**
A. **Monitoring 3D student performances**: Elicits direct, observable evidence of three-dimensional learning; students are using practices with core ideas and crosscutting concepts to make sense of phenomena and/or to design solutions.	Students use and demonstrate content using core concepts, engineering principles while recognizing patterns and cross cutting concepts in interactive simulations and unit investigations. For example, Teachers may observer and solicit input while students are involved in: Interactive simulation: What does two dimension mean? **Lesson 3-1** Interactive simulations allow students to work within the content, recognizing patterns, and applying engineering principles of collecting and recognizing data. For example: In this interactive simulation, you will adjust the initial position xi and velocity v of a cart so that a position vs. time graph of its motion matches graphical targets. **Lesson 3-2** Investigation 3-B: Graphs and equations are valuable methods for describing the motion of an object. Position versus time and velocity versus time graphs can describe where an object is located, how fast it is going, and which direction it is headed. In this activity you will adjust the motion of a Smart Cart to match the velocity-time graphs below. **Lesson 3-2** Interactive equation: A one-dimensional (1-D) definition of speed is the ratio of distance traveled to time taken: **Lesson 3-2**	☐ None ☐ Inadequate ☐ Adequate ☒ Extensive	
B. **Formative:** Embeds formative assessment processes throughout that evaluate student learning to inform instruction.	Interactive equations, interactive simulations, Test Your Knowledge in each lesson, Lesson "quiz" opportunities and Unit Problems for conceptual development **Chapter 3** Student work opportunities provided within each lesson. For example: 2) Student work: “SolvingHarderPhysicsProblemsAssignment.pdf” **Lesson 3-3**	☐ None ☐ Inadequate ☐ Adequate ☒ Extensive	
C. **Scoring guidance**: Includes aligned rubrics and scoring guidelines that provide guidance for interpreting student performance along the three dimensions to support teachers in (a) planning instruction and (b) providing ongoing feedback to students.	Scoring rubrics are seen in *some of the investigations and interactive simulations. *Rubrics are being developed for all lesson plans and all interactive simulations to help inform instruction and planning	☐ None ☐ Inadequate ☒ Adequate ☐ Extensive	Currently, sample rubrics are only seen in chapter 3. However, rubrics are being developed for all lesson plans and all interactive simulations to help inform instruction and planning

D. **Unbiased tasks/items**: Assesses student proficiency using methods, vocabulary, representations, and examples that are accessible and unbiased for all students.	Interactive equations, interactive simulations, Test Your Knowledge in each lesson, Lesson "quiz" opportunities and Unit Problems for conceptual development **Chapter 3** Assessment evidence provided within the teacher lesson plan document. For example: Objective 1 and 2: Two cars are initially separated by 1.0 km and traveling towards each other. One car travels at 20 miles per hour and the second car travels at 20 meters per second. (in slide presentation) Answers Provided. Objective 2 and 3: A car travels a total distance of 2.0 kilometers. It travels the first kilometer at a constant speed of 15 m/s. It travels the second kilometer at a constant speed of 25 m/s. What is its average speed? (in slide presentation). Answers provided. **Lesson 3-3** Student work opportunities provided within each lesson. For example: 2) Student work: "SolvingHarderPhysicsProblemsAssignment.pdf" **Lesson 3-3**	☐ None ☐ Inadequate ☐ Adequate ☒ Extensive	
Rating for Category III. Monitoring NGSS Student Progress—*lessons* After carefully weighing the evidence, reasoning, and suggestions for improvement, rate the degree to which the lesson met this category. ***If you are evaluating an instructional unit rather than a single lesson, continue on to evaluate criteria E–F and rate Category III overall below.***	***Lesson* Rating scale for Category III (Criteria A–D only):** **3**: At least adequate evidence for all criteria in the category; extensive evidence for at least one criterion **2**: Some evidence for all criteria in the category and adequate evidence for at least three criteria, including A **1**: Adequate evidence for at least two criteria in the category **0**: Adequate evidence for no more than one criterion in the category		**Circle Rating** **0 1 2 3**

Category III: Monitoring NGSS Student Progress (additional criteria *for units only*)

If you are evaluating a lesson, it is not necessary to evaluate criteria E–F. Please enter your rating for a lesson above (after D).

Unit Criteria A unit or longer lesson designed for the NGSS will also include clear and compelling evidence of the following:	**Specific evidence from materials and reviewers' reasoning**	**Evidence of Quality?**	**Suggestions for improvement**
E. **Coherent Assessment system:** Includes pre-, formative, summative, and self-assessment measures that assess three-dimensional learning.	**Pre-assessment** Each Lesson has a powerpoint presentation that provides initial pre-assessment. For example in Lesson 3-2, the following questions are asked at the start of the lesson: **Chapter 3** 1.Where is the speed zero? **Lesson 3-3 PPT Presentation** 2.Where do the two graphs NOT match? **Lesson 3-3 PPT Presentation** 3.Where is the motion forward and where is it backward? **Lesson 3-3 PPT Presentation** 4.Between 1 and 2 seconds, how much distance is covered? **Lesson 3-3 PPT Presentation**	☐ None ☐ Inadequate ☐ Adequate ☒ Extensive	

	5.Sketch these graphs if the velocity at (A) and (C) were changed to 3 m/s. **Lesson 3-3 PPT Presentation** **Formative Assessment:** Interactive equations, interactive simulations, Test Your Knowledge in each lesson, Lesson "quiz" opportunities and Unit Problems for conceptual development **Chapter 3** Assessment evidence provided within the teacher lesson plan document. For example: Objective 1 and 2: Two cars are initially separated by 1.0 km and traveling towards each other. One car travels at 20 miles per hour and the second car travels at 20 meters per second. (in slide presentation) Answers Provided. Objective 2 and 3: A car travels a total distance of 2.0 kilometers. It travels the first kilometer at a constant speed of 15 m/s. It travels the second kilometer at a constant speed of 25 m/s. What is its average speed? (in slide presentation). Answers provided. **Lesson 3-3** Student work opportunities provided within each lesson. For example: 2) Student work: SolvingHarderPhysicsProblemsAssignment.pdf **Lesson 3-3** Imbedded opportunities within each lesson presentation. For example within lesson 3-3: What does the graph look like if you move back to 0 m in the next four seconds**?** **Chapter 3** High-level questions posed within each Lesson Presenation. For example Lesson 3-3: How does the position graph for a high positive velocity differ from a lower positive velocity? **Chapter 3** **Summative:** Assessment opportunities are provided at the end of each lesson presentation. For example lesson 3-3: Sketch these graphs if the velocity at (A) and (C) were changed to 3 m/s. **Chapter 3** Test-bank allows for the development of additional questions to assess student learning **Chapter 3** **Self Assessment:** Students may self assess in interactive simulations that allow students to work within the content, recognizing patterns, and applying engineering principles of collecting and recognizing data. For example: In this interactive simulation, you will adjust the initial position xi and velocity v of a cart so that a position vs. time graph of its motion matches graphical targets. **Chapter 3**		

	Interactive equations, interactive simulations, Test Your Knowledge in each lesson, Lesson "quiz" opportunities and Unit Problems for conceptual development **Chapter 3** Student work opportunities provided within each lesson. For example: 2) Student work: SolvingHarderPhysicsProblemsAssignment.pdf **Lesson 3-3**		
F. **Opportunity to learn**: Provides multiple opportunities for students to demonstrate performance of practices connected with their understanding of disciplinary core ideas and crosscutting concepts and receive feedback	Students demonstrate performance in interactive simulations that allow students to work within the content, recognizing patterns, and applying engineering principles of collecting and recognizing data. For example: In this interactive simulation, you will adjust the initial position xi and velocity v of a cart so that a position vs. time graph of its motion matches graphical targets. **Chapter 3** Students demonstrate performance in Interactive equations, interactive simulations, Test Your Knowledge in each lesson, Lesson "quiz" opportunities and Unit Problems for conceptual development **Chapter 3** Students demonstrate performance in Student work opportunities provided within each lesson. For example: 2) Student work: SolvingHarderPhysicsProblemsAssignment.pdf **Lesson 3-3** Students demonstrate performance in lesson investigations **Chapter 3**	☐ None ☐ Inadequate ☐ Adequate ☒ Extensive	
Rating for Category III: Monitoring NGSS Student Progress—*units* After carefully weighing the evidence, reasoning, and suggestions for improvement, rate the degree to which the criteria are met across the unit.	**Unit Rating scale for Category III (Criteria A–F):** **3**: At least adequate evidence for all criteria in the category; extensive evidence for at least one criterion **2**: Some evidence for all criteria in the category and adequate evidence for at least five criteria, including A **1**: Adequate evidence for at least three criteria in the category **0**: Adequate evidence for no more than two criteria in the category		**Circle Rating** **0 1 2 3**

Category Ratings:

Transfer your team's ratings from each category to the following chart and add the scores together for the overall score:

Category ratings			
Category I: NGSS 3D Design	**Category II: NGSS Instructional Supports**	**Category III: Monitoring NGSS Student Progress**	**Total Score**
0 1 2 3	0 1 2 3	0 1 2 3	9

Overall ratings: The score total is an *approximate* guide for the rating. Reviewers should use the evidence of quality across categories to guide the final rating. In other words, the rating could differ from the total score recommendations if the reviewer has evidence to support this variation.	**E: Example of high quality NGSS design**—High quality design for the NGSS across all three categories of the rubric; a lesson or unit with this rating will still need adjustments for a specific classroom, but the support is there to make this possible; exemplifies most criteria across Categories I, II, & III of the rubric. (total score ~8–9) **E/I: Example of high quality NGSS design if Improved—**Adequate design for the NGSS, but would benefit from some improvement in one or more categories; most criteria have at least adequate evidence (total score ~6–7) **R: Revision needed—**Partially designed for the NGSS, but needs significant revision in one or more categories (total ~3–5) **N: Not ready to review—**Not designed for the NGSS; does not meet criteria (total 0–2)	**Circle the overall rating below:** **E E/I R N**

Overall Summary Comments: