3D Science Performance Assessment Tasks

4th GRADE

LIGHT AND SENSES

These materials were developed under a grant awarded by the Michigan Department of Education

Task Title	Improving Video Game Performance

Standards Bundle
PEs: • 4-LS1-2 Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. • 4-PS4-2 Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
Practices: • Design a solution • Develop and use a model • Construct an evidence based argument
Crosscutting Concepts: • Cause and effect • Systems and system models
Core Ideas: • PS4.B: Electromagnetic Radiation • LS1.D: Information Processing • LS1.A: Structure and Function
CCSS ELA: • SL.4.5: Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-PS4-2)
CCSS Mathematics: • MP.4: Model with mathematics. (4-PS4-2) • 4.G.A.1: Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (4-PS4-2)

Overview / Introduction of the Assessment Task

In this assessment task, students will design a training program that will improve performance in a particular video game. Students will take the role of a professional video game player. The audience for this assessment is editor for a gaming magazine. The real-world situation is producing a how to infographic for the gaming magazine. The performance is the how to infographic. The infographic should include a model for how the brain and senses interact to allow video game play. This infographic should include both internal and external structures involved in the sense/response interaction. A description of should be based on science improve game play. Students will present their infographic tips to the class and the class will vote on which three to include in the magazine.

Teacher Background
Different sense receptors are specialized for particular kinds of information, which may then be processed and integrated by an animal's brain, with some information stored as memories. Animals are able to use their perceptions and memories to guide their actions. Some responses to information are instinctive—that is, animals' brains are organized so that they do not have to think about how to respond to certain stimuli. An object can be seen when light reflected from its surface enters the eyes; the color people see depends on the color of the available light sources as well as the properties of the surface. (Boundary: This phenomenon is observed, but no attempt is made to discuss what confers the color reflection and absorption properties on a surface. The stress is on understanding that light traveling from the object to the eye determines what is seen.)
Information for Classroom Use
Connections to Instruction: This assessment task is composed of two parts. In the first part of the assessment, students will take the role of a science-editing team for a gaming magazine. The audience for this assessment is the editor for a gaming magazine. Teams of students will use the explanatory models that they created in the unit to verify that a tip for improving video game play is based on scientific principles. For the second part, students will take the role of the main editor for the gaming magazine and construct an evidence-based argument for which tip should be included in the magazine
Approximate Duration for the Summative Task: (all components) 3 to 4 days
Assumptions: A student will try to improve their performance on a task when engaged. Students have learned about sensory stimulation and behavior. The students will also understand the path light takes to the eye, and apply that to the new situation.
Materials Needed: Summary tables of information students learned during unit poster paper, markers, paper to write article Produce a copy of *Evaluate Gaming Tips List* for each group
Supplementary Resources: Many Wild Kratts examples of videos showing how light enters the eye and how the brain reacts.

Learning Performances
• Use a systems model to predict how sensory information and animal memories will affect an animal's action. • Use a model to predict how the properties of a light source can affect the way light is perceived. • Apply scientific ideas to design, test, and refine training program that will improve performance in video games.

Phenomenon	Scenario
Video game performance can improve.	Students will design a training plan that will improve performance in video games.

Performance Assessments

<table>
<tr><th colspan="3">Student Performances</th></tr>
<tr><td rowspan="4">Formative Assessment Task 1</td><td colspan="2">Learning Performance: Develop an initial systems model to explain how sensory information and animal memories will affect an animal's action.</td><td rowspan="4">Expected Duration: ~50 minutes</td></tr>
<tr><td colspan="2">Description: Students will experience a phenomenon where the sensory information may not necessarily match how the brain processes information (selective attention test, one hand in warm water, one in cold, both moved to room temperature water, eating food while blindfolded and with nose plugged). Students will construct a systems model that includes the components involved in sensory input and processing and how those components interact to cause a behavior.</td></tr>
<tr><td colspan="2">Directions:
1. Choose a phenomenon for students to create an initial evidence based model.
2. Allow students to experience the phenomenon.
3. Direct students to create an initial systems model that explains the phenomenon.</td></tr>
<tr><td colspan="2">Scoring / Teacher Look-For's: Model should include the following components: environment, information, sense receptor, brain, memory, and action. The model should include words, symbols, and diagrams that explain how these components interact to cause the phenomenon.</td></tr>
<tr><td rowspan="4">Formative Assessment Task 2</td><td colspan="2">Learning Performance: Revise a systems model to explain how sensory information and animal memories will affect an animal's action.</td><td rowspan="4">Expected Duration: ~50 minutes</td></tr>
<tr><td colspan="2">Description: Students will experience another phenomenon where the sensory information may not necessarily match how the brain processes information (selective attention test, one hand in warm water, one in cold, both moved to room temperature water, eating food while blindfolded and with nose plugged). Students will revise and refine their systems model that includes the components involved in sensory input and processing and how those components interact to cause a behavior.</td></tr>
<tr><td colspan="2">Directions:
1. Choose a different phenomenon for students to create an initial evidence based model.
2. Allow students to experience the phenomenon.
3. Direct students to revise and refine their systems model so that explains the both phenomena.</td></tr>
<tr><td colspan="2">Scoring / Teacher Look-For's:
Student will identify senses involved and how that information is processed. Students will further recognize that the stimuli will cause a behavior change.</td></tr>
<tr><td rowspan="2">Final Task:
(Model, Design, Explain, Argue, Investigate)</td><td colspan="2">Phenomena:
After time, students can improve their performance in games.</td><td rowspan="2">Expected Duration: ~2 50 minute sessions</td></tr>
<tr><td>Goal: Design model that can be used evaluate the scientific</td><td>Role: Students will take the role of a science editing team</td></tr>
</table>

	accuracy of a tip will improve performance in a particular video game.	for video game magazine.	
	Audience: The audience for this assessment is editor for a gaming magazine.	Situation: The real-world situation is producing a how to article for the gaming magazine.	
	Product / Performance: The performance is the infographic. The infographic should include a model for how the brain and senses interact to cause a behavior. This model should include both internal and external structures involved in the sense/response interaction as well as the path light takes. In addition to the model, authors will provide a training tip and explain how each tip should will improve the sense/response interaction.		
	Session 1 (and 2): *1.* Connection: Display the two Summary Charts from Cycle 1 and Cycle 2. Reference the charts and say: "*In this unit, we have learned about internal and external structures, how light travels and behaves when it interacts with objects, how the brain and senses interact, and how to develop Explanatory Models. Today you are going to apply what* you have *learned to a new phenomenon: Playing Video Games."* *2.* Introduce the team performance assessment task by telling students that they will be working together as science teams responsible making recommendations for a professional gaming magazine. Say: "*As a team, you will apply what you have learned in this unit to develop and use an Explanatory Model to evaluate whether recommendations for improving how to play a video game are based on correct scientific principles."* 3. Direct students to move back into their teams and give each team a copy of the *Senses and Information Checkbric*. Discuss the checkbric with the class and invite students to brainstorm characteristics of quality for each of the criteria on the checkbric. 4. Distribute "Explanatory Models" developed by the teams during the prior Explain activity. Allow time for students to review their models and to discuss how they might adapt them to include the components involved when someone is playing a video game. Circulate as teams work and encourage deeper thinking. Ask: "*What type of information do you receive from a video game? How does that information get into your brain? Does your model explain how the information gets into your brain? What does your brain do with the information? Do you need to make revisions to your model so that it is specific to video games? What components and interactions do you need to add to your model to use it to explain playing*		

	a video game?" Allow students sufficient time to discuss how their model can be used to explain playing a video game. Select examples of quality work to share. 5. Gather students to the class meeting area. Invite selected teams to share the modifications they would make to their model for the new phenomenon: Playing a Video Game. 6. Give each team a sheet of poster paper and markers and provide time for them to collaboratively develop their model. Circulate as students work, providing feedback and guidance. 7. When teams complete their models, have them display their posters on a wall and provide time for the class to participate in a gallery walk. **Note:** Prior to beginning the gallery walk, share the questions students will be expected to answer independently during Session 3 of this evaluation. Encourage teams to discuss each displayed model and to take notes on how well the model provides evidence that their tip is based on scientific principles. **Session 2 (or 3):** *1.* Connection: Say: "*Last session, you took the role of a member of a science team making recommendations for a gaming magazine. You used your explanatory model to generate evidence that a tip for improving game play was based on scientific principles. Today, you are going to change roles. You will be the head science editor for the gaming magazine. Your job is to construct an evidence-based argument for the gaming tip you think should be included in the magazine.* 2. Distribute copies of the *Evaluate Gaming Tips List*. Direct individual students to use their notes and any posters on the wall as evidence to support their argument for which tip to include. 3. Circulate and monitor as students work. Use observations as data for summative assessment. **Session 3 (or 4)** 1. Connection: Display the two Summary Charts from Cycle 1 and Cycle 2 and say *"Last session you took the role of a head science editor for the gaming magazine. You used evidence-based arguments for the gaming tip you think should be included in the magazine. Today you are going to become a video game designer whose main character will fight monsters in various environments. Your job is to help create some living creatures the main character will meet. Therefore, you will design an animal and a plant character that will thrive in a given environment that*	

	must account for two key internal and external structures specific to one of the following environments: • *Tundra* • *Ocean* • *Desert* • *Tropical rainforest* 2. Students, individually, design models of a plant and an animal using two key internal and external structures that should help them thrive in a given environment. Students are to provide a description with claim, evidence and reasoning to support their choices. 3. Students will join small groups and discuss their models of animals and plants. After discussing, students will choose the animal and plant most likely to thrive based on their internal and external structures for a given environment and corresponding claim, evidence and reasoning. 4. Small groups will share their animal and plant models with the class and defend their choice of the animal and plant most likely to thrive based on their internal and external structures for a given environment and corresponding claim, evidence and reasoning. 5. Teacher will discuss with class how science is used for improving video game performance and game design (including earth science, life science, physical science, and engineering, technology and applications of science)	

CheckBric

Student Name _____

Teacher Name _____

Learning Performance: Use a systems model to explain how sensory information and animal memories will affect an animal's action.					**Comments**
Evidence Statements:					
Model identifies and describes relevant components of the system	**1**	**2**	**3**	**4**	
Model describes the interactions between the components of the system	**1**	**2**	**3**	**4**	
Model describes the connection between environment and behavioral output.	**1**	**2**	**3**	**4**	
LP Total:					
Learning Performance: Use a model to predict how the properties of a light source can affect the way light is perceived.					**Comments**
Evidence Statement:					
Model illustrates light properties	**1**	**2**	**3**	**4**	
LP Total:					
Learning Performance: Apply scientific ideas to design, test, and refine training program that will improve performance in video games.					**Comments**
Evidence Statements:					
Evaluates and critiques evidence from multiple models	**1**	**2**	**3**	**4**	
Uses science reasoning to connect evidence with claim based argument	**1**	**2**	**3**	**4**	
LP Total:					
Checkbric Total					

4 Exemplary	Work at this level is of exceptional quality. It is both thorough and accurate. It exceeds the standard. It shows a sophisticated application of knowledge and skills.
3 Proficient	Work at this level meets the standard. It is acceptable work that demonstrates application of essential knowledge and skills. Minor errors or omissions do not detract from the overall quality.
2 Developing	Work at this level does not meet the standard. It shows basic, but inconsistent application of knowledge and skills. Minor errors or omissions detract from the overall quality. Your work needs further development.
1 Emerging	Work at this level shows a partial application of knowledge and skills. It is superficial (lacks depth), fragmented or incomplete and needs considerable development. Your work contains errors or omissions.