



SCIENCE DISSECTED

Creating Quality Questions to Prepare for the Science HSPE

Developing quality items that assess student understanding is a vital skill for teachers. With the inclusion of the Science High School Proficiency Exam (HSPE) as a requirement for all students graduating in 2010 and beyond, it is essential for teachers to prepare students for the type of questions they will encounter on the exam. The science questions on the HSPE are based on the content within the Nevada State Science Standards. The items on the HSPE have undergone multiple rounds of review and bias testing. Although it is unrealistic to have self-developed questions undergo the same scrutiny, there are certain guidelines that teachers can follow to develop quality HSPE-style questions.

The Science HSPE contains 75 multiple choice questions (60 core items and 15 field test items). The format for all the questions are open stem or closed stem with four distracters that are approximately equal in length. None of the distracters include totally irrelevant or humorous content. There are no analogies, matching, fill-in-the-blank, or constructed response questions on the Science HSPE.

Example of an open stem item:

The passage of genetic information from the parent to the offspring is

- a. heredity.
- b. development.
- c. growth.
- d. evolution.

Example of a closed stem item:

The rotation of a windmill best represents which type of energy?

- a. potential
- b. thermal
- c. electrical
- d. kinetic

The HSPE questions are written using the Depth of Knowledge (DOK) Levels. Level 1 responses involve recall, Level 2 questions require more mental processing and reasoning, and the Level 3 questions necessitate extended cognitive demands.

Guidelines for Question Development:

- ◆ Start with the state standard that you are trying to assess and the skill you want the students to demonstrate (e.g. identify, predict, describe)
- ◆ Determine the DOK Level required to answer the question (1-3)
- ◆ Avoid bias and sensitive issues in question prompts, pictures, and distracters
- ◆ Always use grade appropriate vocabulary in your questions
- ◆ Eliminate any extraneous information in the question
- ◆ State the question in positive terms. If "NOT" is used, then bold it
- ◆ Include quality distracters such as: common misconceptions, plausible incorrect answers, and related concepts from grade level content

KEY POINTS

- ◆ Always focus on *academic experiences*, **not** *life experiences* to avoid biased questions
- ◆ Avoid using "all of the above" or "none of the above" options
- ◆ Ensure the vocabulary used in the question is grade level appropriate
- ◆ Emphasize absolute words such as "NOT" or "ALWAYS"
- ◆ Incorporate distracters that relate to the topic and avoid humorous options
- ◆ Most of the questions on the HSPE are DOK Level 2

Breakdown of Science HSPE by Strand: Physical Science 30%, Life Science 30%, Earth Science 22%, and Nature of Science 18%

**TEST PREPARATION TIPS
FOR TEACHERS**

- ◆ The NV Science HSPE is based upon the NV State Science Standards. The *Targeted Interventions for Proficiency in Science (TIPS)* Website available at www.rpd.net provides detailed information on content, common misconceptions, sample proficiency-style questions, strategies for interventions and additional resources for teachers. This information is available for each of the benchmarks within the 9-12 content strands.
- ◆ Incorporate various science disciplines as much as possible when teaching. For example, while balancing equations, the Chemistry teacher should use the equation for photosynthesis. The Biology teacher who is teaching photosynthesis should tie in why leaves change color in the autumn, relate it to the seasons, and incorporate the properties of light. The Principle of Science teachers have various opportunities throughout the spiraling curriculum to expand on areas where students need assistance.
- ◆ Make connections with previously learned material throughout the school year to ensure that students understand the big ideas of science.
- ◆ Reinforce vocabulary terms throughout the year. Model the appropriate use of terms and encourage students to incorporate science terminology into their responses.
- ◆ Provide students with sample questions that have the same format as the proficiency questions. Analyze the questions to explain why a certain answer is correct and why the other options are incorrect.
- ◆ Provide students with questions that require the analysis of data tables, graphs, and diagrams. Model how to interpret information from figures. Practice answering questions that require analysis of the information on a graph in addition to constructing graphs.
- ◆ Ask questions of varying degrees of difficulty. Students will be asked questions within the three Depth of Knowledge Levels.

**TEST PREPARATION TIPS
FOR STUDENTS**

- ◆ Answer *all* of the questions. The questions are multiple choice with no guess penalty.
- ◆ *Read* the question before you look at any of the answers and determine what the question is asking. If applicable, try to eliminate excess information and focus on the stem of the question.
- ◆ Try to answer the question in your mind *before* you look at the possible answers.
- ◆ Read *all* of the possible answers before making a final selection.
- ◆ If two options seem correct, read each of them again with the stem of the question and compare them. Choose the answer that seems more logical.
- ◆ Use the *process of elimination*. Eliminate the answers that you know are wrong and select the best of the remaining choices.
- ◆ Avoid choosing options that contain words totally unfamiliar to you.
- ◆ Only change the answers to questions that you originally misread.
- ◆ Many of the questions include tables, graphs, and diagrams. Be sure to read the title, labeled axes, and the units of the graph or chart. Follow the trend of the data and try to visualize the situation.
- ◆ Take your time on the test because there is no time limit.
- ◆ Get plenty of rest the night before the exam and eat a healthy breakfast.
- ◆ Be comfortable, but stay alert. Do not slouch in your chair during the test.
- ◆ Stay relaxed and be confident knowing that you have been preparing for the science proficiency exam your entire school career.