This document shows how the science and engineering practices (adapted from the *Next Generation Science Standards;* Achieve, 2013) may be used in the DLM Science Alternate Assessment.

Seven science and engineering practices are currently used in the DLM Science Essential Elements (the practice of asking questions and defining problems may be added later):

- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

These practices are embedded in the DLM Science Essential Elements. This document provides guidance as to how these practices might be articulated across grade levels from Elementary to High School. It is adapted from the NGSS Appendix H.

Science/Engineering Practice	Grade Level		
	EL	**MS**	**HS**
Developing and using models	Models include: physical replicas, drawings, diagrams, storyboards, dramatizations, or dioramas.	In addition to EL, models include: simple physical prototypes of proposed objects, tools, or processes.	In addition to MS, models include: representations of more abstract phenomena and design systems or unobservable mechanisms, including mathematical or computational models.
	Models can be used to: represent concrete events or processes; represent amounts, relationships, relative scales (bigger/smaller) or patterns.	Models can be used to: describe a scientific principle or design solution; predict phenomena; test cause and effect relationships.	Models can be used to: describe unobservable mechanisms; represent inputs and outputs; illustrate the relationships between systems or components of a system.
	Students can be asked to: distinguish between models and the actual objects, process, or events that the model represents; compare models to identify common features and differences; use models to describe phenomena.	Students can be asked to: develop a model of simple systems; revise a model based on evidence; design solutions; identify limitations of models.	Students can be asked to: select between models that best fit the evidence or design criteria; modify a model to match what happens if a variable or component of a system is changed; predict more abstract phenomena

Science/Engineering Practice	Grade Level		
	EL	**MS**	**HS**
Planning and carrying out investigations	Components of investigations include: carrying out investigations including making observations/measurements and collecting data; identifying results.	In addition to EL, components of investigations include: identifying goal of investigation; planning; controlling variables; producing data; predicting outcomes.	In addition to MS, components of investigations include: identifying independent and dependent variables; evaluating data collection methods.
	Investigations can be used to: answer questions; test solutions.	Investigations can be used to: support an explanation or design solution; test a model or a design; compare two different models.	Investigations can be used to: answer scientific questions; provide evidence to support claims; evaluate the performance of a proposed object, tool, or process.
	Students can be asked to: with guidance, conduct simple investigations; identify data that answers a question; make predictions based on prior experiences.	Students can be asked to: evaluate appropriate methods and/or tools for collecting data; plan and conduct an investigation using fair tests; identify and produce data that will serve as the basis for evidence.	Students can be asked to: produce data that provides evidence needed to answer a scientific question or test a design solution; select appropriate tools to collect, record, analyze, and evaluate data; evaluate accuracy of data collection methods; revise an experimental design.

Science/Engineering Practice	Grade Level		
	EL	**MS**	**HS**
Analyzing and interpreting data	Data include: observations (pictures, drawings, writing); thought; ideas.	In addition to EL, data include: tables; graphical displays (bar or line graphs, pictographs, pie charts).	In addition to MS, data include: graphical displays of data sets (maps, charts, graphs).
	Analysis can be used to: describe patterns and relationships; compare predictions; determine if an object or tool works.	Analysis can be used to: reveal patterns that indicate relationships; make sense of phenomena; discuss similarities and differences in findings; refine a problem statement.	Analysis can be used to: identify linear and non-linear relationships; identify temporal and spatial relationships; provide evidence for phenomena.
	Students can be asked to: record information; use and share observations; answer questions; solve problems.	Students can be asked to: conduct multiple trials of qualitative observations; represent, analyze, and interpret data; use data to evaluate and refine design solutions.	Students can be asked to: distinguish between correlation and causation; apply concepts of statistics and probability; evaluate the impact of new data on a working explanation and/or model of a proposed process or system.

Science/Engineering Practice	Grade Level		
	EL	**MS**	**HS**
Using mathematics and computational thinking	Computations include: counting, measuring.	Computations include: area, volume, weight, time.	Computations include: algorithms, ratio, rate, percent, basic operations, simple algebra.
	Mathematical thinking can be used to: describe the natural and designed worlds; compare quantitative attributes; identify patterns.	Mathematical thinking can be used to: organize data; represent relationships; compare design solutions.	Mathematical thinking can be used to: describe and/or support scientific conclusions; solve a problem; test and compare solutions.
	Students can be asked to: use mathematics to represent physical variables; use tools to measure and record data; display data in simple graphs.	Students can be asked to: use computation to analyze data; decide if qualitative or quantitative data are the best evidence; organize simple data sets; describe, measure, estimate, and/or graph quantities; create and use charts and graphs.	Students can be asked to: use mathematics to support explanations and arguments; analyze data sets for patterns or trends; use mathematical representations to solve a problem; test and compare proposed solutions.

Science/Engineering Practice	Grade Level		
	EL	**MS**	**HS**
Constructing explanations and designing solutions	Constructing explanations and designing solutions include: using evidence-based accounts of natural phenomena; using tools and/or materials to design or build a device.	In addition to EL, constructing explanations and designing solutions include: specifying variables that describe and predict phenomena; designing multiple solutions to a design problem.	In addition to MS, constructing explanations and designing solutions include: describing qualitative or quantitative relationships between variables; using models or representations.
	Explanations and design solutions can be used to: explain causes of phenomena; build a device that solves a specific problem.	Explanations and design solutions can be used to: support a claim; identify evidence that supports particular points in an explanation; solve design problems.	Explanations and design solutions can be used to: make claims regarding the relationship of independent and dependent variables; test a design of an object, tool, process, or system; optimize performance of a design.
	Students can be asked to: identify evidence that accounts for natural phenomena; compare multiple solutions to a problem.	Students can be asked to: specify variables that describe the causes of and predict natural phenomena; show relationships between variables; test and refine a device; generate solutions to a design problem.	Students can be asked to: use multiple sources of evidence to construct explanations or design solutions; use qualitative or quantitative relationships between variables; use models or representations; define a problem and propose solutions.

Science/Engineering Practice	Grade Level		
	EL	**MS**	**HS**
Engaging in argument from evidence	Arguments include: comparing ideas and representations about the natural and designed worlds.	In addition to EL, arguments include: citing relevant evidence about the natural and designed worlds.	In addition to MS, arguments include: constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed worlds.
	Arguments can be used to: support a claim; make a claim about the effectiveness of an object, tool, or solution.	Arguments can be used to: distinguish among facts and speculation in an explanation; make a claim about the merits of a solution to a problem.	Arguments can be used to: support or refute an explanation or a model for a phenomenon or a solution to a problem; evaluate competing design solutions.
	Students can be asked to: identify arguments that are supported by evidence; distinguish between explanations that account for all gathered evidence and those that do not; distinguish between opinions and evidence in one's own explanations; listen actively to arguments and retell the main points of arguments.	Students can be asked to: compare and refine arguments based on an evaluation of the evidence; use data to evaluate claims about cause and effect; support an argument with evidence, data, or a model.	Students can be asked to: compare two arguments on the same topic; present a written argument; evaluate design solutions based on criteria.

Science/Engineering Practice	Grade Level		
	EL	**MS**	**HS**
Obtaining, evaluating, and communicating information	Information includes: observations and grade-appropriate text, text features; and other media; models, drawings, writing, or numbers.	In addition to EL, information includes: multiple sources: text with corresponding tables, diagrams and/or charts; multiple texts; texts and other media.	In addition to MS, information includes: scientific text adapted for classroom use; qualitative and quantitative scientific and/or technical information.
	Information can be used to: communicate new information; answer scientific questions; support a scientific claim.	Information can be used to: evaluate the merit and accuracy of ideas and methods; support engagement in other scientific and/or engineering practices; explain phenomena or solutions to a design problem.	Information can be used to: evaluate the merit and validity of ideas and methods; clarify claims and findings; describe patterns in and/or evidence about the natural and designed worlds.
	Students can be asked to: read grade-appropriate texts and/or use media to obtain information; describe how specific images support a scientific or engineering idea; use text features (headings, tables of contents, glossaries, electronic menus, icons) to answer scientific questions; communicate design ideas and/or solutions with others.	Students can be asked to: obtain and summarize scientific and technical ideas; compare and/or combine information from multiple sources; communicate scientific and/or technical information using various forms of media as well as tables, diagrams, and charts.	Students can be asked to: determine central ideas in scientific texts; integrate qualitative and quantitative information; gather, read, and synthesize information from multiple sources; evaluate data, hypotheses and/or conclusions in scientific and technical texts; communicate scientific and/or technical information.