GLOBE ASSESSMENT FRAMEWORK STRATEGY LINKAGE TABLE – Elementary School

GLOBE Classroom Assessment Framework Strategies **Planning investigations**	**N**ational **R**esearch **C**ouncil's **N**ational **S**cience **E**ducation **S**tandards for **Inquiry**	**A**merican **A**ssociation for the **A**dvancement of **S**cience's **BENCHMARKS**	**T**hird **I**nternational **M**ath & **S**cience **S**tudy	**NEW STANDARDS** Standards in: Scientific Thinking, Tools & Technologies, Communication
Students set up a new, appropriate problem/application	· Ask questions that can be answered with scientific knowledge and observations.	· People can often learn about things around them by just observing those things carefully. (page 10) · Raise questions about the world around them and be willing to seek answers to some of them by making careful observations and trying things out. (page 285)	Investigating the natural world	S5e – identify problems; proposes and implements solutions; evaluates the accuracy, design and outcomes of investigations
Students design an experiment	· Answer questions by seeking information from reliable sources and from their own observations and investigations · Design and conduct simple experiments to answer questions. · Consider what it means to be a "fair test"/ experiment.	· (students) can learn more by doing something … and noting what happens. (page 10) · Scientific investigations take many different forms, including … collecting specimens for analysis, and doing experiments. (page 11) · … be willing to seek answers to some of them by … trying things out. (page 285) · Recognize when comparisons might not be fair because some conditions are not kept the same. (page 299) · Measure and mix dry and liquid materials (in the kitchen, garage, or laboratory) in prescribed amounts, exercising reasonable safety. (page 293)	Using tools, routine procedures and science processes	S5e – identify problems; proposes and implements solutions; evaluates the accuracy, design and outcomes of investigations S8 – complete at least one "full investigation" each year as well as other laboratory work that represent controlled experiment, fieldwork, design, secondary research, such as use of others' data
Students specify measurements/variables to investigate	· Consider what it means to be a "fair test"/ experiment.	· Measure the length in whole units of objects having straight edges. (page 293) · Measure and mix dry and liquid materials (in the kitchen, garage, or laboratory) in prescribed amounts, exercising reasonable safety. (page 293)	Using tools, routine procedures and science processes	S5a - identifies or controls variables in experimental and non-experimental research settings S5e – identify problems; proposes and implements solutions; evaluates the accuracy, design and outcomes of investigations
Students pose relevant questions	· Ask questions that can be answered with scientific knowledge and observations. · Answer questions by seeking information from reliable sources and from their own observations and investigations	· People can often learn about things around them by just observing those things carefully. (page 10) · Raise questions about the world around them and be willing to seek answers to some of them by making careful observations and trying things out. (page 285)	Theorizing, analyzing and solving problems	S5a – asks questions about natural phenomena; objects and organisms; and events and discoveries S5e – identify problems; proposes and implements solutions; evaluates the accuracy, design and outcomes of investigations

GLOBE ASSESSMENT FRAMEWORK STRATEGY LINKAGE TABLE – Elementary School

GLOBE Classroom Assessment Framework Strategies **Taking measurements**	**N**ational **R**esearch **C**ouncil's **N**ational **S**cience **E**ducation **S**tandards for **Inquiry**	**A**merican **A**ssociation for the **A**dvancement of **S**cience's **BENCHMARKS**	**T**hird **I**nternational **M**ath & **S**cience **S**tudy	**NEW STANDARDS Standards in: Scientific Thinking, Tools & Technologies, Communication**
Observations and measurements are accurate and appropriate	· Answer questions by seeking information from reliable sources and from their own observations and investigations · Design and conduct simple experiments to answer questions. · Consider what it means to be a "fair test"/ experiment.	· (students) can learn more by doing something … and noting what happens. (page 10) · Scientific investigations take many different forms, including observing what things are like or what is happening somewhere, …(page 11) · … be willing to seek answers to some of them by making careful observations (page 285) · Describing things as accurately as possible is important in science because it enables people to compare their observations with those of others. (page 10) · Recognize when comparisons might not be fair because some conditions are not kept the same. (page 299)	Using tools, routine procedures and science processes	S6a – Uses technology and tools (rulers, computers, balances, thermometers, watches, magnifiers, and microscopes) to gather data and extend the senses S8 – collect and record data in ways that others can verify
Equipment is used properly	· Observe, measure, cut, connect, switch, turn on and off, pour, hold tie and hood. · Use rulers, thermometers, watches, beam balances, spring scales, magnifiers and microscopes. · Use computers and calculators to conduct investigations.	· Use calculators to determine area and volume from linear dimensions, aggregate amounts of area, volume, weight, time, and cost, and find the difference between two quantities of anything. (page 293) · Read and follow step-by-step instructions in a calculator or computer manual when learning new procedures. (page 290)	Using tools, routine procedures and science processes	S6a – Uses technology and tools (rulers, computers, balances, thermometers, watches, magnifiers, and microscopes) to gather data and extend the senses
Measurement Quality Errors are detected Quality assurance procedures are employed (multiple, repeated readings, re-calibration)	· Consider what it means to be a "fair test"/ experiment.	· Describing things as accurately as possible is important in science because it enables people to compare their observations with those of others. (page 10) · Recognize when comparisons might not be fair because some conditions are not kept the same. (page 299)	Theorizing, analyzing and solving problems	S6a – Uses technology and tools (rulers, computers, balances, thermometers, watches, magnifiers, and microscopes) to gather data and extend the senses

GLOBE ASSESSMENT FRAMEWORK STRATEGY LINKAGE TABLE – Elementary School

GLOBE Classroom Assessment Framework Strategies **Analyze and compare GLOBE data**	**N**ational **R**esearch **C**ouncil's **N**ational **S**cience **E**ducation **S**tandards for **Inquiry**	**A**merican **A**ssociation for the **A**dvancement of **S**cience's **BENCHMARKS**	**T**hird **I**nternational **M**ath & **S**cience **S**tudy	**NEW STANDARDS Standards in: Scientific Thinking, Tools & Technologies, Communication**
Identify data components			Understanding simple information	
Identify similarities and differences	· Determine what constitutes evidence and judge merits or strength of data and information that will be used to make explanations.	· Buttress statements with facts. (page 299) · Results of scientific investigations are seldom exactly the same, but if the differences are large, it is important to try to figure out why. One reason for following directions carefully and for keeping records of one's work is to provide information on what might have caused the differences. (page 11)	Understanding complex information	S5c – uses evidence from reliable sources to construct explanations
Explain reasons for differences	· Determine what constitutes evidence and judge merits or strength of data and information that will be used to make explanations. · Appeal to knowledge and evidence to support explanations. · Check explanations against scientific knowledge, experiences and observations of others.	· Buttress statements with facts. (page 299) · Results of scientific investigations are seldom exactly the same, but if the differences are large, it is important to try to figure out why. (page 11) · Ask "How do you know?" in appropriate situations and attempt reasonable answers when others ask them the same question. (page 298, 299) · Scientists' explanations about what happens in the world come partly from what they observe, partly from what they think. (page 11) · Offer reasons for their findings and consider reasons suggested by others. (page 296) · Scientists do not pay much attention to claims about how something they know about works unless the claims are backed up with evidence that can be confirmed and with a logical argument. (page 11)	Theorizing, analyzing and solving problems	S5c – uses evidence from reliable sources to construct explanations S7b – argues from evidence, such as data produced through experimentation
Use appropriate mathematical procedures	· Measure, collect and organize data · Use variables to express relationships · Develop skills of estimation and judgment			S6b – Collects and analyzes data using concepts and techniques in Mathematics Standard 4, such as average, data displays, graphing, variability, and sampling

GLOBE ASSESSMENT FRAMEWORK STRATEGY LINKAGE TABLE – Elementary School

GLOBE Classroom Assessment Framework Strategies **Interpret GLOBE data**	**N**ational **R**esearch **C**ouncil's **N**ational **S**cience **E**ducation **S**tandards for **Inquiry**	**A**merican **A**ssociation for the **A**dvancement of **S**cience's **BENCHMARKS**	**T**hird **I**nternational **M**ath & **S**cience **S**tudy	**NEW STANDARDS Standards in: Scientific Thinking, Tools & Technologies, Communication**
Infer patterns, trends	· Recognize and describe patterns		Theorizing, analyzing and solving problems	S5c – uses evidence from reliable sources to construct explanations S7b – argues from evidence, such as data produced through experimentation
Explain data and relationships	· Determine what constitutes evidence and judge merits or strength of data and information that will be used to make explanations. · Appeal to knowledge and evidence to support explanations. · Check explanations against scientific knowledge, experiences and observations of others.	· Buttress statements with facts. (page 299) · Ask "How do you know?" in appropriate situations and attempt reasonable answers when others ask them the same question. (page 298, 299) · Scientists' explanations about what happens in the world come partly from what they observe, partly from what they think. (page 11) · Offer reasons for their findings and consider reasons suggested by others. (page 296) · Scientists do not pay much attention to claims about how something they know about works unless the claims are backed up with evidence that can be confirmed and with a logical argument. (page 11)	Understanding complex information	S5b – use concepts from Standards 1 – 4 to explain a variety if observations and phenomena S5c – uses evidence from reliable sources to construct explanations
Create multiple formats for representing data		· Use numerical data in describing and comparing objects and events. (page 296) · Describe and compare things in terms of number, shape, texture, size, weight, color, and motion. (page 296) · Draw pictures that correctly portray at least some features of the thing being described. (page 296)	Communicating	S5d – proposes, recognizes, analyzes, considers, and critiques alternative explanations S7a – represent data and results in multiple ways, such as numbers, tables and graphs, drawings, diagrams and artwork; and technical and creative writing

GLOBE ASSESSMENT FRAMEWORK STRATEGY LINKAGE TABLE – Elementary School

GLOBE Classroom Assessment Framework Strategies **Communicate**	**N**ational **R**esearch **C**ouncil's **N**ational **S**cience **E**ducation **S**tandards for **Inquiry**	**A**merican **A**ssociation for the **A**dvancement of **S**cience's **BENCHMARKS**	**T**hird **I**nternational **M**ath & **S**cience **S**tudy	**NEW STANDARDS Standards in: Scientific Thinking, Tools & Technologies, Communication**
Compose informal and informal discourse to inform, explain, persuade AND Create and make presentations of key conclusions and findings	· Communicate, critique and analyze the work of others. · Communicate in the form of writing, drawing and oral language	· In doing science, it is often helpful to work with a team and to share findings with others. (page 15) · Clear communication is an essential part of doing science. It enables scientists to inform others about their work, expose their ideas to criticism by other scientists, and stay informed about scientific discoveries around the world. (page 16) · Draw pictures that correctly portray at least some features of the thing being described. (page 296) · Write instructions that others can follow in carrying out a procedure. (page 296) · Make sketches to aid in explaining procedures or ideas. (page 296)	Communicating	S5f – Works in teams to collect and share information and ideas S7a – Represents data in multiple ways, such as numbers, tables and graphs, drawings, diagrams and artwork and technical and creative writing. S7b – Uses facts to support conclusions. S7c – Communicates in a form suited to the purpose and the audience S8 – results are communicated appropriately to audiences

GLOBE ASSESSMENT STRATEGY LINKAGE TABLE – Middle School

GLOBE Classroom Assessment Framework Strategies <u>Planning investigations</u>	**N**ational **R**esearch **C**ouncil's **N**ational **S**cience **E**ducation **S**tandards for **Inquiry**	**A**merican **A**ssociation for the **A**dvancement of **S**cience**'s BENCHMARKS**	**T**hird **I**nternational **M**ath & **S**cience **S**tudy	**NEW STANDARDS** **Standards in: Scientific Thinking, Tools & Technologies, Communication**
Students set up a new, appropriate problem/application	· Clarify questions & inquiries and direct them toward objects and phenomena that can be described, explained or predicted by scientific investigations.	· Raise questions about the world around them and be willing to seek answers to some of them by making careful observations and trying things out. (285)	Investigating the natural world	S5a - frames questions to distinguish cause and effect S5e – identify problems; proposes and implements solutions;
Students design an experiment	· Clarify questions & inquiries and direct them toward objects and phenomena that can be described, explained or predicted by scientific investigations. · Design and execute both full-scale and limited investigations.	· Although there is no fixed set of steps that all scientists follow, scientific investigations usually involve the collection of relevant evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, and explanations to make sense of the collected evidence. (12)	Using tools, routine procedures and science processes	S5e – identify problems; proposes and implements solutions; evaluates the accuracy, design and outcomes of investigations S8 – complete at least one "full investigation" each year as well as other laboratory work that represent controlled experiment, fieldwork, design, secondary research, such as use of others' data
Students specify measurements/variables to investigate	· Identify and control variables. · State explanations in terms of the relationships between two or more variables. · Make systematic observations and accurate measurements. · Identify and control variables.	· If more than one variable changes at the same times in an experiment, the outcome of the experiment may not be clearly attributable to any one of the variables. (12) · Read analog and digital meters on instruments used to make direct measurements of length, volume, weight, elapsed time, rates, temperature, and choose appropriate units for reporting various magnitudes. (294)	Using tools, routine procedures and science processes	S5a - identifies or controls variables in experimental and non-experimental research settings S5e – identify problems; proposes and implements solutions; evaluates the accuracy, design and outcomes of investigations
Students pose relevant questions	· Clarify questions & inquiries and direct them toward objects and phenomena that can be described, explained or predicted by scientific investigations.	· Raise questions about the world around them and be willing to seek answers to some of them by making careful observations and trying things out. (285)	Theorizing, analyzing and solving problems	S5a - frames questions to distinguish cause and effect S5a - frames questions to distinguish cause and effect

GLOBE ASSESSMENT STRATEGY LINKAGE TABLE – Middle School

GLOBE Classroom Assessment Framework Strategies **Taking measurements**	**N**ational **R**esearch **C**ouncil's **N**ational **S**cience **E**ducation **S**tandards for **Inquiry**	**A**merican **A**ssociation for the **A**dvancement of **S**cience's **BENCHMARKS**	**T**hird **I**nternational **M**ath & **S**cience **S**tudy	**NEW STANDARDS** **Standards in: Scientific Thinking, Tools & Technologies, Communication**
Observations and measurements are accurate and appropriate	· Make systematic observations and accurate measurements. · Technology used to gather data enhances accuracy and allows scientists to analyze and quantify results of investigations. · The use of tools (…) will be guided by the questions asked and the investigations students design	· Scientific investigations may take many different forms, including observing what things are like or what is happening somewhere, collecting specimens for analysis, and doing experiments. (11) · Distinguish actual observations from ideas and speculations about what was observed. (293)	Using tools, routine procedures and science processes	S6a – use technology and tools to observe and measure objects, organisms, and phenomena, directly, indirectly and remotely S8 – collect and record data in ways that others can verify
Equipment is used properly	· The use of tools (…) will be guided by the questions asked and the investigations students design.	· Read analog and digital meters on instruments used to make direct measurements of length, volume, weight, elapsed time, rates, temperature, and choose appropriate units for reporting various magnitudes. (294) · Computers have become invaluable in science because they speed up and extend people's ability to collect, store, compile, and analyze data, prepare research reports, and share data and ideas with investigators all over the world. - Technology is essential to science for such purposes as access to outer space and other remote locations, sample collection and treatment, measurement, data collection and storage, computation, and communication of information. (46)	Using tools, routine procedures and science processes	S6a – use technology and tools to observe and measure objects, organisms, and phenomena, directly, indirectly and remotely
Measurement Quality Errors are detected Quality assurance procedures are employed (multiple, repeated readings, re-calibration)	· Technology used to gather data enhances accuracy and allows scientists to analyze and quantify results of investigations. · Decide what evidence should be used to account for anomalous data.	· Be skeptical of arguments based on very small samples of data, biased samples, or samples for which there was no control sample. Be aware that there may be more than one good way to interpret a given set of findings. (299) · Scientists know about danger to objectivity and take steps to try and avoid it when designing investigations and examining data. (12)	Theorizing, analyzing and solving problems	S6e – recognizes sources of bias in data, such as observer and sampling biases

GLOBE ASSESSMENT STRATEGY LINKAGE TABLE – Middle School

GLOBE Classroom Assessment Framework Strategies **Analyze and compare GLOBE data**	**N**ational **R**esearch **C**ouncil's **N**ational **S**cience **E**ducation **S**tandards for **Inquiry**	**A**merican **A**ssociation for the **A**dvancement of **S**cience's **BENCHMARKS**	**T**hird **I**nternational **M**ath & **S**cience **S**tudy	**NEW STANDARDS** **Standards in: Scientific Thinking, Tools & Technologies, Communication**
Identify data components	· Access, gather, store, retrieve and organize data.	· Technology is essential to science for such purposes as … data collection and storage, computation … (46)	Understanding simple information	S6b – records and stores data using a variety of formats
Identify similarities and differences	· Provide causes for effects and establish relationships based on evidence and logical argument.	· Hypotheses are used for choosing what data to pay attention to and what additional data to seek, and for guiding the interpretation of the data. (13)	Understanding simple information	S5c – uses evidence from reliable sources to develop descriptions, explanations and models
Explain reasons for differences	· Understand how this investigation compares with current scientific knowledge. · Provide causes for effects and establish relationships based on evidence and logical argument. · Decide what evidence should be used to account for anomalous data. · Review and summarize data to form logical argument about cause and effect. · State explanations in terms of the relationships between two or more variables.	· Know that often different explanations can be given for the same evidences and it is not always possible to tell which one is correct (287) · Hypotheses are uses for choosing what data to pay attention to and what additional data to seek, and for guiding the interpretation of the data. (13) · Some aspects of reasoning have fairly rigid rules for what makes sense. (233) · Sometimes people invent a general rule to explain how something works by summarizing observation. (233) · A single example can never prove that something is always true, but sometimes a single example can prove that something is not always true. (233)	Understanding complex information	S5c – uses evidence from reliable sources to develop descriptions, explanations and models S7b – argues from evidence, such as data produced through experimentation S5a - frames questions to distinguish cause and effect

GLOBE ASSESSMENT STRATEGY LINKAGE TABLE – Middle School

GLOBE Classroom Assessment Framework Strategies **Analyze and compare GLOBE data** (continued)	**N**ational **R**esearch **C**ouncil's **N**ational **S**cience **E**ducation **S**tandards for **Inquiry**	**A**merican **A**ssociation for the **A**dvancement of **S**cience's **BENCHMARKS**	**T**hird **I**nternational **M**ath & **S**cience **S**tudy	**NEW STANDARDS** **Standards in: Scientific Thinking, Tools & Technologies, Communication**
Use appropriate mathematical procedures	· The use of tools and techniques, including mathematics and computers, will be guided by the question asked and the investigations. · Develop data table, plot data on a graph, complete calculations, estimate, interpolate/extrapolate, represent situations numerically. · Represent situations verbally, numerically, graphically, geometrically or symbolically · Use estimations · Identify and use functional relationships · Develop and use tables, graphs, and rules to describe situations · Use statistical methods to describe, analyze, evaluate and make decisions · Use geometry in solving problems · Create experimental and theoretical models of situations involving probabilities	· Use calculators to compare amounts proportionally. Use computers to store and retrieve information in topical, alphabetical, numerical, and key-word files, and create simple files of their own devising. (294)	Theorizing, analyzing and solving problems	S6c – collects and analyzes data using concepts and techniques in Math Standard 4, such as mean, median and mode; outcome probability and reliability; and appropriate data display

GLOBE ASSESSMENT STRATEGY LINKAGE TABLE – Middle School

GLOBE Classroom Assessment Framework Strategies **Interpret GLOBE data**	**N**ational **R**esearch **C**ouncil's **N**ational **S**cience **E**ducation **S**tandards for **Inquiry**	**A**merican **A**ssociation for the **A**dvancement of **S**cience's **BENCHMARKS**	**T**hird **I**nternational **M**ath & **S**cience **S**tudy	**NEW STANDARDS** **Standards in: Scientific Thinking, Tools & Technologies, Communication**
Infer patterns, trends	· Provide causes for effects and establish relationships based on evidence and logical argument.		Theorizing, analyzing and solving problems	S5c – uses evidence from reliable sources to develop descriptions, explanations and models S7b – argues from evidence, such as data produced through experimentation
Explain data and relationships	· Use subject matter knowledge, as well as observations to develop explanations and establish connections between the content of science and the other contexts. · Differentiate between explanation and description. · Provide causes for effects and establish relationships based on evidence and logical argument. · Review and summarize data to form logical argument about cause and effect. · State explanations in terms of the relationships between two or more variables.	· Offer reasons for their findings and consider reasons suggested by other. (286) · Hypotheses are uses for choosing what data to pay attention to and what additional data to seek, and for guiding the interpretation of the data. (13) · Some aspects of reasoning have fairly rigid rules for what makes sense. (233) · Sometimes people invent a general rule to explain how something works by summarizing observation. (233) · A single example can never prove that something is always true, but sometimes a single example can prove that something is not always true. (233)	Understanding complex information	S5a - frames questions to distinguish cause and effect S5b – use concepts from Standards 1 – 4 to explain a variety if observations and phenomena S5c – uses evidence from reliable sources to develop descriptions, explanations and models S7b – argues from evidence, such as data produced through experimentation
Create multiple formats for representing data	· Use computers for the summary and display of data · Propose alternative explanations	· Graphs can show a variety of possible relationships between two variables. (219)	Communicating	S7a – represent data and results in multiple ways, such as numbers, tables and graphs, drawings, diagrams and artwork; and technical and creative writing S5d – proposes, recognizes, analyzes, considers, and critiques alternative explanations

GLOBE ASSESSMENT STRATEGY LINKAGE TABLE – Middle School

GLOBE Classroom Assessment Framework Strategies **Communicate**	**N**ational **R**esearch **C**ouncil's **N**ational **S**cience **E**ducation **S**tandards for **Inquiry**	**A**merican **A**ssociation for the **A**dvancement of **S**cience's **BENCHMARKS**	**T**hird **I**nternational **M**ath & **S**cience **S**tudy	**NEW STANDARDS** **Standards in: Scientific Thinking, Tools & Technologies, Communication**
Compose informal and informal discourse to inform, explain, persuade AND Create and make presentations of key conclusions and findings	· Listen to and respect the explanations proposed by others. · Acknowledge different ideas and explanations. · Accept the skepticism of others and consider alternative explanations. · Describe observations. · Summarize results. · Tell others about experiments and explanations.	· Scientific investigations may take many different forms, including observing what things are like or what is happening somewhere, collecting specimens for analysis and doing experiments. (11)	Communicating	S5f – works in teams to collect and share information and ideas S7d – explains a scientific concept or procedure to other students S7e – communicates in a form suited to the purpose and the audience, such as by writing instructions that others can follow; critiquing written and oral explanations; and using data to resolve disagreements S8 – results are communicated appropriately to audiences

GLOBE ASSESSMENTSTRATEGY LINKAGE TABLE – High School

GLOBE Classroom Assessment Framework Strategies **Planning investigations**	**N**ational **R**esearch **C**ouncil's **N**ational **S**cience **E**ducation **S**tandards for **Inquiry**	**A**merican **A**ssociation for the **A**dvancement of **S**cience's **BENCHMARKS**	**T**hird **I**nternational **M**ath & **S**cience **S**tudy	**NEW STANDARDS** **Standards in: Scientific Thinking, Tools & Technologies, Communication**
Students set up a new, appropriate problem/application	· Formulate testable hypothesis. · Demonstrate logical connections between the scientific concepts guiding a hypothesis and the experimental design. · Clarify the question, method, control and variables.	· Hypotheses are widely used in science for choosing what data to pay attention to and what additional data to seek, and for guiding the interpretation of the data (both new and previously available.) (page 13)	Investigating the natural world	S5a - frames questions to distinguish cause and effect S5c – Makes appropriate adjustments and improvements based on additional data or logical arguments S5e – identify problems; proposes and implements solutions; evaluates the accuracy, design and outcomes of investigations
Students design an experiment	· Formulate testable hypothesis. · Assist with methodological problems and recommend technology to guide the inquiry. · Clarify the question, method, control and variables. · Revise methods and explanations	· Hypotheses are widely used in science for choosing what data to pay attention to and what additional data to seek, and for guiding the interpretation of the data (both new and previously available.) (page 13) · Sometimes, scientists can control conditions in order to obtain evidence. (page 13)	Using tools, routine procedures and science processes	S5e – identify problems; proposes and implements solutions; evaluates the accuracy, design and outcomes of investigations S8 – complete at least one "full investigation" each year as well as other laboratory work that represent controlled experiment, fieldwork, design, secondary research, such as use of others' data
Students specify measurements/variables to investigate	· Clarify the question, method, control and variables.	· Hypotheses are widely used in science for choosing what data to pay attention to and what additional data to seek, and for guiding the interpretation of the data (both new and previously available.) (page 13) · Sometimes, scientists can control conditions in order to obtain evidence. (page 13)	Using tools, routine procedures and science processes	S5a - identifies or controls variables in experimental and non-experimental research settings S5e – identify problems; proposes and implements solutions; evaluates the accuracy, design and outcomes of investigations
Students pose relevant questions	· Formulate testable hypothesis. · Demonstrate logical connections between the scientific concepts guiding a hypothesis and the experimental design. · Demonstrate appropriate procedures, knowledge base and conceptual understanding of scientific investigations. · Clarify the question, method, control and variables.	· Hypotheses are widely used in science for choosing what data to pay attention to and what additional data to seek, and for guiding the interpretation of the data (both new and previously available.) (page 13) · Sometimes, scientists can control conditions in order to obtain evidence. (page 13)	Theorizing, analyzing and solving problems	S5a - frames questions to distinguish cause and effect S5e – identify problems; proposes and implements solutions; evaluates the accuracy, design and outcomes of investigations S5a - frames questions to distinguish cause and effect

GLOBE ASSESSMENTSTRATEGY LINKAGE TABLE – High School

GLOBE Classroom Assessment Framework Strategies <u>**Taking Measurements**</u>	**N**ational **R**esearch **C**ouncil's **N**ational **S**cience **E**ducation **S**tandards for **Inquiry**	**A**merican **A**ssociation for the **A**dvancement of **S**cience's **BENCHMARKS**	**T**hird **I**nternational **M**ath & **S**cience **S**tudy	**NEW STANDARDS** **Standards in: Scientific Thinking, Tools & Technologies, Communication**
Observations and measurements are accurate and appropriate	· Use hand tools, measuring instruments and calculators as integral components of scientific investigations. · Use computers to collect, analyze, and display data. · Rely on technology to enhance the gathering and manipulation of data	· Computers have become invaluable in science because they speed up and extend people's ability to collect, store, compile, and analyze data … (page 18) · Accurate record-keeping, openness, and replication are essential for maintaining an investigator's credibility with other scientists and society. (page 18)	Using tools, routine procedures and science processes	S6a – use technology and tools to observe and measure objects, organisms, and phenomena, directly, indirectly and remotely, with appropriate consideration for accuracy and precision S8 – collect and record data in ways that others can verify
Equipment is used properly	· Use proper equipment and safety precautions. · Use hand tools, measuring instruments and calculators as integral components of scientific investigations.	· Mathematical models and computer simulations are used in studying evidence … (page 65) · Use computer spreadsheet, graphing, and database programs to assist in quantitative analysis. (page 291)	Using tools, routine procedures and science processes	S6a – use technology and tools to observe and measure objects, organisms, and phenomena, directly, indirectly and remotely, with appropriate consideration for accuracy and precision
Measurement Quality Errors are detected Quality assurance procedures are employed (multiple, repeated readings, re-calibration)	· The accuracy of the data and therefore the quality of the exploration depends on the technology used. · Engage in discussions and arguments that result in revision of explanations.	· Trace the source of any large disparity between an estimate and the calculated answer. (page 291) · Suggest alternative ways of explaining data and criticize arguments in which data, explanations, or conclusions are represented as the only ones worth consideration, with no mention of other possibilities. (page 300) · Scientific knowledge is subject to modification. (page 7) · Scientific teams are expected to seek out the possible sources of bias in the design of their investigations and in their data analysis. (page 13)	Theorizing, analyzing and solving problems	S6a – Uses technology and tools to observe and measure objects, organisms, and phenomena, directly, indirectly, and remotely, with appropriate consideration of accuracy and precision S6e – recognizes sources of bias in data, such as observer and sampling biases

GLOBE ASSESSMENTSTRATEGY LINKAGE TABLE – High School

GLOBE Classroom Assessment Framework Strategies **Analyze and compare GLOBE data**	**N**ational **R**esearch **C**ouncil's **N**ational **S**cience **E**ducation **S**tandards for **Inquiry**	**A**merican **A**ssociation for the **A**dvancement of **S**cience's **BENCHMARKS**	**T**hird **I**nternational **M**ath & **S**cience **S**tudy	**NEW STANDARDS** **Standards in: Scientific Thinking, Tools & Technologies, Communication**
Identify data components	· Formulate an explanation or model (physical, conceptual or mathematical)	· Different models can be used to represent the same thing. … The usefulness of a model may be limited if it is too simple or if it is needlessly complicated. Choosing a useful model is one of the instances in which a intuition and creativity come into play in science, mathematics, and engineering. (page 269)	Understanding simple information	S6b – records and stores data using a variety of formats
Identify similarities and differences	· Review current scientific understanding, weigh evidence and examine logic to decide which explanations and models are best. · Use scientific criteria to find the preferred explanation.	· Use and correctly interpret relational terms such as if. . .then. . ., and, or, sufficient, necessary, some, every, not, correlates with, and causes. (page 297) · The usefulness of a model can be tested by comparing its predictions to actual observations in the real world. But a close match does not necessarily mean that the model is the only "true" model or the only one that would work. (page 270)	Understanding complex information	S5c – uses evidence from reliable sources to develop descriptions, explanations and models

GLOBE ASSESSMENTSTRATEGY LINKAGE TABLE – High School

GLOBE **Classroom Assessment Framework Strategies** **Analyze and compare GLOBE data**	**N**ational **R**esearch **C**ouncil's **N**ational **S**cience **E**ducation **S**tandards for **Inquiry**	**A**merican **A**ssociation for the **A**dvancement of **S**cience's **BENCHMARKS**	**T**hird **I**nternational **M**ath & **S**cience **S**tudy	**NEW STANDARDS** **Standards in: Scientific Thinking, Tools & Technologies, Communication**
Explain reasons for differences	· Use evidence, apply logic and construct argument for proposed explanations · Use scientific knowledge, logic and evidence during discussions · Review current scientific understanding, weigh evidence and examine logic to decide which explanations and models are best. · Use scientific criteria to find the preferred explanation.	· There are different traditions in science about what is investigated and how, but they all have in common certain basic beliefs about the value of evidence, logic, and good arguments. (page 13) · To be convincing, an argument needs to have both true statements and valid connections among them. (page 234) · Use and correctly interpret relational terms such as if. . .then. . ., and, or, sufficient, necessary, some, every, not, correlates with, and causes. (page 297) · The usefulness of a model can be tested by comparing its predictions to actual observations in the real world. (page 270)	Theorizing, analyzing and solving problems	S5c – uses evidence from reliable sources to develop descriptions, explanations and models S7b – argues from evidence, such as data produced through experimentation S5a - frames questions to distinguish cause and effect

GLOBE ASSESSMENTSTRATEGY LINKAGE TABLE – High School

GLOBE Classroom Assessment Framework Strategies **Analyze and compare GLOBE data**	**N**ational **R**esearch **C**ouncil's **N**ational **S**cience **E**ducation **S**tandards for **Inquiry**	**A**merican **A**ssociation for the **A**dvancement of **S**cience's **BENCHMARKS**	**T**hird **I**nternational **M**ath & **S**cience **S**tudy	**NEW STANDARDS** **Standards in: Scientific Thinking, Tools & Technologies, Communication**
Use appropriate mathematical procedures	· Use computers to collect, analyze, and display data. · Use mathematics in all aspects of a scientific inquiry · Rely on technology to enhance the gathering and manipulation of data · Develop ability to use realistic applications and modeling in trigonometry · Understand connections within a problem situation, its model as a function in symbolic form and the graph of that function · Use functions that are constructed as models of real-world problems · Know how to use statistics and probability	· Computers have become invaluable in science because they speed up and extend people's ability to collect, store, compile, and analyze data … (page 18) · Mathematical models and computer simulations are used in studying evidence … (page 65) · Use ratios and proportions, including constant rates, in appropriate problems. (page 291) · Find answers to problems by substituting numerical values in simple algebraic formulas and judge whether the answer is reasonable by reviewing the process and checking against typical values. (page 291) · Use computer spreadsheet, graphing, and database programs to assist in quantitative analysis. (page 291) · Compare data for two groups by representing their averages and spreads graphically. (page 291)		S6c – collects and analyzes data using concepts and techniques in Math Standard 4, such as mean, median and mode; outcome probability and reliability; and appropriate data display

GLOBE ASSESSMENTSTRATEGY LINKAGE TABLE – High School

GLOBE Classroom Assessment Framework Strategies **Interpret GLOBE data**	**N**ational **R**esearch **C**ouncil's **N**ational **S**cience **E**ducation **S**tandards for **Inquiry**	**A**merican **A**ssociation for the **A**dvancement of **S**cience's **BENCHMARKS**	**T**hird **I**nternational **M**ath & **S**cience **S**tudy	**NEW STANDARDS** **Standards in: Scientific Thinking, Tools & Technologies, Communication**
Infer patterns, trends	· Use scientific knowledge, logic and evidence during discussions.	· Logic requires a clear distinction among reasons. (page 234) · Wherever a general rule comes from, logic can be used in testing how well it works. (page 234) · Use and correctly interpret relational terms such as if/then, and/or, sufficient/necessary, some/every, not, correlates with, and causes. (page 297)	Theorizing, analyzing and solving problems	S5c – uses evidence from reliable sources to develop descriptions, explanations and models S7b – argues from evidence, such as data produced through experimentation

GLOBE ASSESSMENTSTRATEGY LINKAGE TABLE – High School

GLOBE Classroom Assessment Framework Strategies **Analyze and compare GLOBE data** (continued)	**N**ational **R**esearch **C**ouncil's **N**ational **S**cience **E**ducation **S**tandards for **Inquiry**	**A**merican **A**ssociation for the **A**dvancement of **S**cience's **BENCHMARKS**	**T**hird **I**nternational **M**ath & **S**cience **S**tudy	**NEW STANDARDS** **Standards in: Scientific Thinking, Tools & Technologies, Communication**
Explain data and relationships	· Use evidence, apply logic and construct argument for proposed explanations · Engage in discussions and arguments that result in revision of explanations. · Review current scientific understanding, weigh evidence and examine logic to decide which explanations and models are best. · Use scientific criteria to find the preferred explanation.	· Suggest alternative ways of explaining data and criticize arguments in which data, explanations, or conclusions are represented as the only ones worth consideration, with no mention of other possibilities. (page 300) · The usefulness of a model can be tested by comparing its predictions to actual observations in the real world. (page 270) · Logic requires a clear distinction among reasons. (page 234)	Understanding complex information	S5b – use concepts from Standards 1 – 4 to explain a variety if observations and phenomena S5c – uses evidence from reliable sources to develop descriptions, explanations and models S7b – argues from evidence, such as data produced through experimentation S5a - frames questions to distinguish cause and effect
Create multiple formats for representing data	· Organize and display the data. · Revise methods and explanations · Formulate an explanation or model (physical, conceptual or mathematical)	· Suggest alternative ways of explaining data and criticize arguments in which data, explanations, or conclusions are represented as the only ones worth consideration, with no mention of other possibilities. (page 300)	Communicating	S7a – represent data and results in multiple ways, such as numbers, tables and graphs, drawings, diagrams and artwork; and technical and creative writing S5d – proposes, recognizes, analyzes, considers, and critiques alternative explanations

GLOBE ASSESSMENTSTRATEGY LINKAGE TABLE – High School

GLOBE Classroom Assessment Framework Strategies **<u>Communicate</u>**	**N**ational **R**esearch **C**ouncil's **N**ational **S**cience **E**ducation **S**tandards for **Inquiry**	**A**merican **A**ssociation for the **A**dvancement of **S**cience's **BENCHMARKS**	**T**hird **I**nternational **M**ath & **S**cience **S**tudy	**NEW STANDARDS** **Standards in: Scientific Thinking, Tools & Technologies, Communication**
Compose informal and informal discourse to inform, explain, persuade AND Create and make presentations of key conclusions and findings	· Make public presentation of results with critical response from peers. · Engage in discussions and arguments that result in revision of explanations. · Use scientific knowledge, logic and evidence during discussions. · Write and follow procedures, express concepts, review information, summarize data, use language appropriately, develop diagrams and charts, explain statistical analysis, speak clearly and logically, construct a reasoned argument and respond appropriately to critical comments.	· Participate in group discussions on scientific topics … (page 297) · Suggest alternative ways of explaining data and criticize arguments in which data, explanations, or conclusions are represented as the only ones worth consideration, with no mention of other possibilities. (page 300) · There are different traditions in science about what is investigated and how, but they all have in common certain basic beliefs about the value of evidence, logic, and good arguments. (page 13) · To be convincing, an argument needs to have both true statements and valid connections among them. (page 234) · Logic requires a clear distinction among reasons. (page 234) · Use and correctly interpret relational terms such as if. . .then. . ., and, or, sufficient, necessary, some, every, not, correlates with, and causes. (page 297) · Use tables, charts, and graphs in making arguments and claims in oral and written presentations.	Communicating	S5f – works in teams to collect and share information and ideas S7d – explains a scientific concept or procedure to other students S7e – communicates in a form suited to the purpose and the audience, such as by writing instructions that others can follow; critiquing written and oral explanations; and using data to resolve disagreements S8 – results are communicated appropriately to audiences