Appendix B
What Students Should Understand, Do, and Know

By the end of Kindergarten students should be able to:

Understand:

- People can learn about things around them by just observing those things carefully.
- People are more likely to believe your ideas if you can give reasons for them.
- It is often helpful to work in a team and share findings with each other.
- Change happens to many things.
- Some changes are so slow or so fast that they are hard to see.
- Things move in many different ways.
- Most things are made of parts.

Do:

- Observe the world around them and report on their observations.
- Demonstrate scientific processes, e.g., how wind and water move non-living things.
- Sort, group, and classify different materials.
- Compare and contrast, e.g., light and dark, physical properties of objects and how they affect their movement, the parts of different animals
- Investigate, interpret, and explain to others.
- Examine scientific phenomena, e.g., what happens when you block the sun's light.
- Communicate and share findings with others, e.g. ways weather can affect individuals
- Describe and discuss the world around them based on their observations and records e.g., weather conditions and how predicting the world around them can improve our lives.
- Conduct simple experiments and explain their findings, e.g., why things may not work the same if some of the parts are missing.
- Construct questions, give reasons, and share findings with others.

Know:

- Big rocks break down into small rocks.
- Water and wind move non-living things.
- Earth materials can be sorted, grouped, and classified based on their properties.
- Light and dark in a day-night cycle form a pattern.
- Weather changes occur from day to day.
- Weather patterns occur from season to season.
- Weather changes affect individuals in different ways.
- Objects move in different ways, e.g., fast, slow, zigzag, round and round, straight line, back and forth, slide, roll, bounce, spin, swing, float, glide.
- Different objects move in different ways.
- Parts are used to build things and things can be taken apart.
- Things may not work the same if some of the parts are missing.
- Young plants and animals change over time as they grow into adults.
- The relationship between body parts and the five senses.
- Major parts of plants, e.g., roots, stem, leaf, flower, trunk, branches.
- Major parts of different animals, e.g., skin, fur, feathers, scales, hand, winds, flippers, fins.

Appendix B (continued)
What Students Should Understand, Do, and Know

By the end of First Grade students should be able to:

Understand:

- People can often learn about things around them by just observing those things carefully, but sometimes they can learn more by doing something to the things and noting what happens.
- In doing science, it is often helpful to work with a team and to share findings with others. In this sharing, describing things as accurately as possible is important in science because it enables people to compare their observations with those of others .
- When people give different descriptions of the same thing, it is usually a good idea to make some fresh observations instead of just arguing about who is right.
- The natural world is composed of different materials.
- The sun can be seen only in the daytime and the moon can be seen sometimes during the day.
- Seasonal weather changes occur each year.
- Things move in many different ways, such as straight, zig zag, round and round, back and forth, and fast and slow.
- The way to change how something is moving is to give it a push or pull.
- Objects can be described in terms of the materials they are made of (clay, cloth, paper, etc.). and their physical Properties (color, size, shape, weight, texture, flexibility, etc.).
- Offspring are very much alike, but not exactly, like their parents and like one another.
- There is a variation among individuals of one kind within a population.
- Some animals and plants are alike in the way they look and things they do, and others are very different from one another.
- Most living things need water, food, and air.
- All kinds of living things have offspring, usually with two parents involved.
- Plants and animals need to take in water, and animals need to take in food. In addition, plants need light.
- Animals eat plants and other animals for food.

Do:

- Observe, compare, describe, sort, and chart objects by observable characteristics.
- Identify and describe scientific properties, e.g. water source, characteristics of seasons of the year, characteristics of weather, how animals and plants sustain life.
- Record weather information during each season.
- Gather evidence and report their findings.
- Observe, describe, and record scientific phenomena, e.g., changes in the appearance of the sun and moon during daylight, weather information within each season.
- Compare and contrast properties of scientific phenomena, e.g., seasonal weather pattern, the movement of objects
- Use drawing, graphs, and numbers to communicate findings.
- Predict, test, record data, and describe experimental results.
- Analyze similarities and differences between and within groups.
- Use the five senses to make observations in nature.
- Describe and model life cycles.
- Communicate and share findings with others.
- Conduct simple experiments and explain their findings.
- Construct questions, give reasons, and share findings with others.

Know:

- The components of soil have size, texture, and color.
- Water has a variety of natural sources including streams, lakes, and oceans.
- Rocks, soils, and water have many uses.
- The sun changes in location and appearance during the daytime.
- The moon can be seen in the daytime and varies in location and appearance.
- The characteristics of the seasons of the year.
- The characteristics of different types of weather, e.g., types of precipitation, sunny, foggy, and cloudy.
- Objects can move in many different ways, e.g., straight, zigzag, circular, curved, back-and-forth, fast and slow.
- A push or pull can affect how an object moves.
- Objects have observable properties that can be used in their classification.
- Objects have measureable properties such as weight and temperature.
- Objects will sink or float depending on their observable and/or measurable properties.
- Matter may change when heated, cooled, or mixed with water.

- Both plant and animal offspring have similarities with their parents.
- There may be both similarities and differences within and across larger groups.
- They can use their five senses to observe living things and their environments.
- Plants and animals use earth materials to sustain life.
- Living things have life cycles.

Appendix B (continued)
What Students Should Understand, Do, and Know

By the end of Second Grade students should be able to:

Understand:

- When science investigation is done the way it was done before, we expect to get a very similar result.
- Sometimes people aren't sure what will happen because they don't know everything that might have an effect.
- It is often helpful to work with a team and to share findings with others. All team members should reach their own individual conclusions, however, about what the findings mean.
- Chunks of rocks come in many sizes and shapes, from boulders to grains of sand and even smaller.
- There are recognizable patterns among objects in the night sky.
- Some changes, such as changes in weather can vary based on season and location.
- Things near the earth fall to the ground unless something holds them up.
- Things can be done to materials to change some of their properties, but not all materials respond the same way to what is done to them.
- All living things need water, food, air, waste removal, and a particular range of temperatures in their environment.
- Animals, including humans, have parts that help them seek, find, and take in food when they feel hunger—eyes and noses for detecting food, legs to get it, arms to carry it away and a mouth to eat it.
- Senses can warn individuals about danger; muscles help them to fight, hide, or get out of danger.
- Some kinds of living things that once lived on earth have completely disappeared, although they were something like others that are alive today.
- Different plants and animals have external features that help them thrive in different kinds of places.
- Living things are found almost everywhere in the world. There are somewhat different kinds in different places.

Do:

- Explain weathering and breakage of rocks.
- Describe, classify, and communicate scientific ideas, e.g., ,rocks in terms of their parts, stars in the night sky,
- Observe, compare, describe and sort objects by their characteristics and properties, e.g., color, hardness, texture, layering, particle size
- Observe, describe, record, and compare patterns in nature.
- Compare and contrast, e.g., seasonal weather patterns, characteristics of living things in various habitats

- Observe and identify scientific phenomena, e.g., observe falling objects and identify things that prevent them from reaching the ground.
- Communicate about their observations, e.g., similar objects of varying masses fall at the same rate.
- Model changes in various materials, e.g., physical changes
- Analyze and interpret data, e.g. temperatures in different locations and different times,
- Investigate and provide evidence to others.
- Develop, communicate, and justify a scientific explanation, e.g., why a habitat is or is not suitable for a specific organism, how the physical characteristics of living things help them meet their basic needs.
- Create possible explanations for natural phenomena, e.g., why some organisms no longer exist but similar organisms are still alive today. Identify responses of living things to their environment.
- Communicate and share findings with others.
- Conduct simple experiments and explain their findings.
- Construct questions, give reasons, and share findings with others.

Know:

- Smaller rocks come from the breakage and weathering of larger rocks.
- Rocks have parts that can be used in their classification.
- Rocks can be sorted by their color, hardness, texture, layering, and particle size.
- Changes in the moon's appearance and apparent motion can be described in terms of patterns.
- Stars have brightness and color differences and can be described by their arrangement.
- The seasons of the year have discernible patterns.
- Temperatures can and do change based on location and time.
- Objects close to the earth fall toward it but can be stopped before reaching the ground.
- Similar objects of varying masses will fall at the same rate.
- Physical changes can occur to earth materials.
- Matter is not destroyed or created through changes.
- Living things in different habitats have characteristics that can be compared and contrasted .
- Different habitats are suitable for different organisms.
- Some organisms that once lived on the earth no longer exist though similar organisms are still on the earth.
- The physical characteristics of living things along with their behaviors and reactions help them to meet their basic needs.
- The behaviors and reactions of living things can and do change in response to changes in the environment including seasonal changes.