SOUTH CAROLINA SUPPORT SYSTEMS INSTRUCTIONAL GUIDE	
Content Area	**First Grade Mathematics**
Recommended Days of Instruction	**Fourth Nine Weeks**

Standards/Indicators Addressed:

Standard 1-2: The student will demonstrate through the mathematical processes a sense of quantity and numeral relationships; the relationships among addition, subtraction, and related basic facts; and the connections among numeric, oral, and written-word forms of whole numbers.

1-2.9 Analyze the magnitude of digits through 999 on the basis of their place value. (B4)- yearlong

Standard 1-3: The student will demonstrate through the mathematical processes a sense of numeric patterns, the relationship between addition and subtraction, and change over time.

1-3.6 Classify change over time as quantitative or qualitative. (B2)

Standard 1-5: The student will demonstrate through the mathematical processes a sense of the value of combinations of coins and the measurement of length, weight, time, and temperature.

1-5.8 Use analog and digital clocks to tell and record time to the half hour. (C3) yearlong

1-5.9 Illustrate past and future dates on a calendar. (A2) yearlong

1-5.10 Represent dates in standard form (June 1, 2007, for example) and numeric form (6-1-2007, for example). (A2) yearlong

1-5.11 Use Celsius and Fahrenheit thermometers to measure temperature. (C3) yearlong

Standard 1-6: The student will demonstrate through the mathematical processes a sense of collecting, organizing, and interpreting data and of making predictions on the basis of data.

1-6.1 Use survey questions to collect data. (C3)

1-6.2 Organize data in picture graphs, object graphs, bar graphs, and tables. (B4)

1-6.3 Interpret data in picture graphs, object graphs, bar graphs, and tables by using the comparative terms *more, less, greater, fewer, greater than,* and *less than*. (B2)

1-6.4 Predict on the basis of data whether events are *likely* or *unlikely* to occur. (B2)

* These indicators are covered in the following 2 Module for this Nine Weeks Period.
Teaching time should be adjusted to allow for sufficient learning experiences in each of the modules.

Module 4-1 Year Long Indicators			
Indicator	**Recommended Resources**	**Suggested Instructional Strategies**	**Assessment Guidelines**
1-2.9 Analyze the magnitude of digits through 999 on the basis of their place value. (B4)- 1-5.8 Use analog and digital clocks to tell and record time to the half hour. (C3) 1-5.9 Illustrate past and future dates on a calendar. (A2) 1-5.10 Represent dates in standard form (June 1, 2007, for example) and numeric form (6-1-2007, for example). (A2) 1-5.11 Use Celsius and Fahrenheit thermometers to measure temperature. (C3)	NCTM's Online Illuminations http://illuminations.nctm.org/ NCTM's Navigations Series SC Mathematics Support Document Teaching Student-Centered Mathematics Grades K-3 and Teaching Elementary and Middle School Mathematics Developmentally 6th Edition, John Van de Walle NCTM's Principals and Standards for School Mathematics (PSSM) Hands On Standards Grade PreK-K and 1-2, Learning Resources		
Module 4-2 Collection, Data Analysis, Change in Various Contexts			

Indicator	Recommended Resources	Suggested Instructional Strategies	Assessment Guidelines
Module 4-2 Lesson A Using Survey Questions to Collect Data and Organize Graphs 1-6.1 Use survey questions to collect data (C3) 1-6.2 Organize data in picture graphs, object graphs, bar graphs, and tables. (B4)	NCTM's Online Illuminations http://illuminations.nctm.org/ NCTM's Navigations Series SC Mathematics Support Document Teaching Student-Centered Mathematics Grades K-3 and Teaching Elementary and Middle School Mathematics Developmentally 6th Edition, John Van de Walle NCTM's Principals and Standards for School Mathematics (PSSM) Hands On Standards Grade PreK-K and 1-2, Learning Resources	See Instructional Planning Guide Module 4-2 Introductory Lesson A See Instructional Planning Guide Module 4-2, Lesson A Additional Instructional Strategies	See Instructional Planning Guide Module 4-2 Lesson A Assessment
Module 4-2 Lesson B Interpreting Data 1-6.3 Interpret data in picture graphs, object graphs, bar graphs, and tables by suing the comparative terms more, less, greater, fewer, greater than, and less than. (B2)		See Instructional Planning Guide Module 4-2 Introductory Lesson B See Instructional Planning Guide Module 4-2Lesson B Additional Instructional Strategies	See Instructional Planning Guide Module 4-2 Lesson B Assessment

Module 4-2 Lesson C Likely or Unlikely 1-6.4 Predict on the basis of data whether events are likely or unlikely to occur. (B2)		See Instructional Planning Guide Module 4-2 Introductory Lesson C See Instructional Planning Guide Module 4-2, Lesson C Additional Instructional Strategies	See Instructional Planning Guide Module 4-2 Lesson C Assessment
Module 4.2 Quantitative or Qualitative 1-3.6 Classify change over time as quantitative or qualitative. (B2)		See Instructional Planning Guide Module 4-2 Introductory Lesson D See Instructional Planning Guide Module 4-2, Lesson D Additional Instructional Strategies	See Instructional Planning Guide Module 4-2 Lesson D Assessment

MODULE

4-1

Year Long Indicators

This module addresses the following indicators:

1-2.9 Analyze the magnitude of digits through 999 on the basis of their place value. (B4)
1-5.8 Use analog and digital clocks to tell and record time to the half hour. (C3)
1-5.9 Illustrate past and future dates on a calendar. (A2)
1-5.10 Represent dates in standard form (June 1, 2008, for example) and numeric form (6-1-2008, for example). (A2)
1-5.11 Use Celsius and Fahrenheit thermometers to measure temperature. (C3)

This module contains 4 lessons. These indicators were first introduced in First Nine Weeks. These lessons are **INTRODUCTORY ONLY.** Lessons in S^3 begin to build the conceptual foundation students need. **ADDITIONAL LESSONS will be required** to fully develop the concepts.

I. Planning the Module

The first bullet under the Continuum of Knowledge represents students prior knowledge and/or skills related to this standard. It is recommended that students are pre-assessed on this prior knowledge.

- **Continuum of Knowledge**

1-2.9 Analyze the magnitude of digits through 999 on the basis of their place value. (B4)

- In kindergarten, students analyzed the magnitude of digits through 99 on the basis of their place value (K-2.6) and represented the place value of each digit in a two-digit whole number (K-2.7)
- In first grade, students analyze the magnitude of digits through 999 on the basis of their place value (1-2.9).
- In second grade, students will analyze the magnitude of digits through 9,999 on the basis of their place value.

1-5.8 Use analog and digital clocks to tell and record time to the half hour. (C3)

- In kindergarten, students use analog and digital clocks to tell time to the hour. (K-5.6)
- In first grade, students use analog and digital clocks to tell and record time to the half hour. (1-5.8)
- In second grade, students use analog and digital clocks to tell and record time to the nearest quarter hour and to the nearest five-minute interval. (2-5.7)

1-5.9 Illustrate past and future dates on a calendar. (A2)

- In kindergarten, students use a calendar to identify dates, days of the week, and months of the year (K-5.7).
- In first grade, students illustrate past and future dates on a calendar (1-5.9).

1-5.10 Represent dates in standard form (June 1, 2008, for example) and numeric form (6-1-2008, for example). (A2)

- In kindergarten, students use a calendar to identify dates, days of the week, and months of the year (K-5.7).
- In first grade, represent dates in standard form (June 1, 2007, for example) and numeric form (6-1-2007, for example) (1-5.10).

1-5.11 Use Celsius and Fahrenheit thermometers to measure temperature. (C3)

- In kindergarten, students identify digital and standard thermometers as devices used to measure temperature (K-5.4). Students understand which measure-length, weight, time, or temperature-is appropriate for a given situation (K-5.5).

- In first grade, students use Celsius and Fahrenheit thermometers to measure temperature (1-5.11).
- In second grade, students use appropriate tools to measure temperature on Celsius and Fahrenheit thermometers (2-5.3).

- **Key Concepts/ Key Terms**

  *These are vocabulary terms that are reasonable for students to know and be able to use. Terms without the * are additional terms for teacher awareness, knowledge and use in conversation with students.

*Analog
*Digital
*Hour
Half hour
*Calendar
*Date
*Days of the week
*Months of the year
*Past
*Present
*Future
*Celsius
*Fahreheit
*Thermometer
*Temperature
*Degrees
*Scale
*Measure
*Magnitude
*Place value

II. Teaching the Lesson(s)

Teacher Notes: Mathematics learning builds over the course of time. This is especially true with concepts such as number sense and measurement. As a result some topics are best acquired through repeated exposure in small on-going intervals of time. Therefore, while an introductory lesson has been provided for the concepts addressed in Module 1-1, First Nine Weeks, it is important to point out that students will need on-going formal and informal experiences throughout the year to ensure the automaticity and flexibility that is demonstrated with mathematical understanding.

First grade students should continue to use concrete and pictorial materials to build understanding on the concepts addressed in First Nine Weeks in Module 1-4 as well as Second Nine Weeks in Module 2-1 and again in Third Nine Weeks Module 3-1 for these year-long indicators. Please refer to these modules and provide learning experiences that builds on prior learning to meet the indicators.

MODULE

4-2

Collection, Data Analysis, Change in Various Contexts

This module addresses the following indicators:

1-3.6 Classify change over time as quantitative or qualitative. (B2)
1-6.1 Use survey questions to collect data. (C3)
1-6.2 Organize data in picture graphs, object graphs, bar graphs, and tables. (B4)
1-6.3 Interpret data in picture graphs, object graphs, bar graphs, and tables by using the comparative terms *more, less, greater, fewer, greater than,* and *less than*. (B2)
1-6.4 Predict on the basis of data whether events are *likely* or *unlikely* to occur. (B2)

This module contains __4__ lessons. These lessons are **INTRODUCTORY ONLY**. Lessons in S3 begin to build the conceptual foundation students need. **ADDITIONAL LESSONS will be required** to fully develop the concepts.

I. Planning the Module

The first bullet under the Continuum of Knowledge represents students prior knowledge and/or skills related to this standard. It is recommended that students are pre-assessed on this prior knowledge.

- **Continuum of Knowledge**

1-3.6 Classify change over time as quantitative or qualitative. (B2)
- Students did not use quantitative and qualitative change in kindergarten.
- In first grade, student classify change over time as quantitative and qualitative (1-3.6)
- In second grade, students identify quantitative and qualitative change over time (2-3.4) and analyze quantitative and qualitative change over time (2-3.5).

1-6.1 Use survey questions to collect data. (C3)
- In kindergarten, students did not use questions as a catalyst to collect data.
- In first grade, this is the students' first experience with collecting data. Students will use survey questions to collect data (1-6.1)
- In second grade, students will create survey questions to collect data (2-6.1)

1-6.2 Organize data in picture graphs, object graphs, bar graphs, and tables. (B4)
- In kindergarten, students organized data in graphic displays in the form of drawings and pictures (K-6.2).

- In first grade, students will organize data in picture graphs, object graphs, bar graphs, and tables (1-6.2)

- In second grade, students will be organizing data in charts, pictographs, and tables. (2-6.2)

1-6.3 Interpret data in picture graphs, object graphs, bar graphs, and tables by using the comparative terms *more, less, greater, fewer, greater than,* and *less than*. (B2)
- In kindergarten, students did not use comparative language to interpret data. Kindergarten students interpreted data in graphic displays in the form of drawing and pictures (K-6.2)
- In first grade, students will interpret data in picture graphs, object graphs, bar graphs, and tables by using the comparative terms more, less, greater, fewer, greater than, and less than.(1-6.3)

- In second grade, students will infer trends in a data set as increasing, decreasing, or random. (2-6.3)

1-6.4 Predict on the basis of data whether events are likely or unlikely to occur. (B2)

- In kindergarten, students did not use predictions to determine the likelihood of an event.
- In first grade, this is the first experience students will have with predicting on the bases of data whether events are likely or unlikely to occur (1-6.4)

- In second grade, students will expand on prior knowledge to make predictions on the basis of data whether events are more likely or less likely to occur (2-6.4)

- **Key Concepts/Key Terms**

  *These are vocabulary terms that are reasonable for students to know and be able to use. Terms without the * are additional terms for teacher awareness, knowledge and use in conversation with students.

*Collect
*Survey
*Organize
*Data
*Picture graph
*Object graph
*Bar graph
*Tables
*more
*Less
*greater
*fewer
*greater than
*Less than
*Predict
*likely
*unlikely
*Quality
*Quantity
collection
quantitative
qualitative
questions

II. Teaching the Lesson(s)

1. Teaching Lesson 4-2A Basic Data Survey and Graphs

1-6.1 Use survey questions to collect data. (C3)

For this indicator it is **essential** for students to:

- Understand that they are being asked to give specific information.

- Understand that they must keep the information organized.

For this indicator it is **not essential** for students to:
- Generate their own questions to collect data.

1-6.2 Organize data in picture graphs, object graphs, bar graphs, and tables. (B4)

For this indicator it is **essential** for students to:
- Label the data in the graphs and tables (title, increments, key, etc.)
- Use picture, object, and bar graphs as well as a table.

For this indicator it is **not essential** for students to:
- Generate their own questions to collect data.
- Create their own graphs to organize data.

Teacher Notes: In kindergarten, students organized and interpreted data in graphic displays in the form of drawings and pictures. In first grade, survey questions will be given to students and used to collect data, which will be organized in picture graphs, object graphs, bar graphs, and tables. Picture graphs, object graphs, and bar graphs may be oriented horizontally or vertically because it is appropriate for students to become comfortable with organizing the data in different formats. The questions given by the teacher should generate interest in events that occur at school each day and connect real-life events back to the students. For example, at the start of each day, a survey question can be posed to students on the board and read to them. When responding to the question and thus organizing the data, students move their individual pictures of themselves onto the graph to create a picture graph. For example the teacher may pose the following survey questions to the students to create a picture graph:

- What is your lunch choice today? The choices are corn dogs, hamburgers, or a chef salad.
- What is your eye color? Is it blue, green, brown, black, or hazel?
- How many people live in your house? Are there 2, 3, 4, 5, 6, 7, or 8 or more?

It is important to use surveys and organize data into the graphs on a daily basis in mathematics and other subject areas and to incorporate problem solving and reasoning through teacher and student generated questions about the data.

a. Indicators with Taxonomy

1-6.1 Use survey questions to collect data. (C3)
Cognitive Process Dimension: Apply
Knowledge Dimension: Procedural Knowledge

1-6.2 Organize data in picture graphs, object graphs, bar graphs, and tables. (B4)
Cognitive Process Dimension: Analyze
Knowledge Dimension: Conceptual Knowledge

b. Introductory Lesson (this lesson may need to cover a couple of days)
Adapted from: Hands-On Standards: Grades 1-2, Learning Resources, Inc. pp. 134-135.

Materials Needed :
- Color Tiles (15 of each color per pair…have extra available)
- Graphing Grid Paper (1 per pair)
- Paper (1 sheet per pair)

Suggested Literature Connection: 3 Little Firefighters by Stuart J. Murphy (reinforces the concept of sorting information)

Part One: Pose the following situation for your class: Your class is able to get a new color of marker for the board- yellow, green, red or blue. Which color is the most favorite of all students in your class? Dialogue with students about what might be the best way to find out that information? Tell students that sometimes we have to survey others to find out information. In order to do that, we need to pose a question. After we pose our survey question, what are some ways in which we might collect that data? (i.e. tally results) In order to answer this question, survey the class to find out how many and which color does each prefer. Use tally marks on the board to show how many children choose each color and have students record these results on their paper as well.

Teacher Note: Prior to representing the data in a graph format, you may choose to allow students to represent data in their own way or use a format that has been previously used in class. For example, this lesson depicts a bar graph, but an object graph is another possible representation using real markers.

Part Two: (Complete this part in pairs.) Now that students have collected the needed data, they need to organize their data. Tell students that one way we organize data is in a graph format.

It's an easier way for us to see a picture of our data and by doing so, we'll easily be able to see what color everyone liked the best. Today, we are going to represent our data by making a bar graph. Using the grid paper, guide children in setting up their bar graph by labeling four columns at the bottom with each of the names of colors they could choose from: yellow, green, red, blue. Then, have them number each of the rows on their grid paper, beginning at the bottom with one and numbering through eight. (Depending on the number of students, the graph may be numbered higher or lower.) Using the color tiles, have students represent the tally marks for each color: For each tally mark, put one tile on the grid paper. Once each pair has finished their graph, dialogue about the graph as a class. Possible questions: Which color did the class choose as their favorite? How do you know? Which was the second favorite color among everyone? How do you know? Compare colors with how many more or less. Have students write a number graph using collected data. Compare it with the bar graph. Ask them which graph is easier to see the favorite color right away. Children can also move into coloring the bar graph, using other objects to represent the marker, etc.

Note: Watch for children whose number of tiles may not correlate with the number of tally marks. It may be easier to have children count out all of the needed tiles for the tally marks and then place them on their graph.

c. Misconceptions/Common Errors

No typical student misconceptions noted at this time.

d. Additional Instructional Strategies/Differentiation

- The questions given by the teacher should generate interest in events that occur at school each day and connect real-live events back to the students. For example, at the start of each day, a survey question can be posed to students on the board and read to them. For each survey question, have students display their data in multiple formats.
- The teacher will provide questions that will elicit a choice to be made by students based on the student's experiences. Survey questions are to be provided by the teacher where students can either answer them or take those questions and collect data from their peers, family, or other members of the school environment. Students should be able to verbalize what data they collected.

- Allow the children to create questions they would like answered about their classmates to collect data and create representations.
  Examples:
  Number of students who are bus riders/car riders
  Number of students who own pets
  Favorite type of music
  Favorite T.V. show
- Similar to the picture graph, an object graph is three-dimensional and can be set up easily with a shower curtain liner or solid tablecloth and masking tape. Use the masking tape to create an array or grid of rectangles on the curtain or tablecloth to resemble a graph. This is commonly referred to as a "floor graph" because it is placed on the floor for all students to see and touch.
- The teacher should supply the students with many examples of completed graphs and tables. Special notation should be made to the different parts of a graph or table. Students should be able to identify the title of a graph or table, understand the increments and key of each type of graph or table.
- Having students create human bar graphs and participate in the construction of object graphs support student understanding through incorporating movement which is a proven strategy to reinforce retention.
- *Gather children around and read them a story about brother and sisters. The book, A Very Special Sister by Dorothy Hoffman Levi (1992), which is about a young deaf child who expecting a new brother or sister. (*If the book, Very Special Sister is not available simply tell the students a story about brother and sisters.) Create groups for this activity in pairs or small teams.

  The young girl is worried that if the new baby can hear, her mother will love the new baby more than her. After the story, ask the students to predict how many sisters their classmates have. Explain that they should think of an average number of sisters.

  Explain during this lesson, the students will conduct a survey that will show many sisters each student has. Explain that they will receive a variety of materials (listed above) in order to conduct their survey. Allow the children to work in pairs or groups to conduct their survey. Provide each pair or team with a class list to use at their discretion. The children should be given ample time to mingle around the room to conduct the surveys. When all groups have completed their surveys, ask the students to discuss what they learned from the data they gathered. Next, "If we wanted to show many sisters each of us had, how could we represent that?" Give the children an opportunity to

display the data for the number of sisters from the class. Again, give the students ample time to create their displays. Afterwards, ask questions: What does this display show? Which display best shows the number of sister most of us have? Which display best shoes how many sisters each of us has? Which display do you think is easier to read?

These questions listed above are not intended to be judgmental in any; their purpose is to show students the variety of ways to represent data. Ask each group of students to explain their reasoning for their display. Encourage the students to ask questions about the displays to clarify thinking and possibly giving the students another strategy for displaying data.

(Adapted from: Navigating through Data Analysis and Probability in Prekindergarten-Grade 2, National Council of Teachers of Mathematics, 2004.)

e. Technology

Virtual manipulatives should NOT take the place of concrete manipulation of objects/materials. Once conceptual understanding has been reached, you may move to pictorial representations and then virtual manipulatives. Concrete manipulatives should be the focus of learning to build conceptual understanding. Real life situations/representations are critical for conceptual understanding.

f. Assessing the Lesson:

Give the students an opportunity to brainstorm a question that they want the class to answer. For example, what is your favorite sport? Allow the children to collect the information and independently create graph. Observe the students creating the graph and record data.

1. How do we conduct a survey?
2. How can we gather and organize data?
3. How can represent the data we gather?
4. What information can we gather from data, charts, and graphs?
5. As you reflect on your activity today, what do you learn about data and how to represent it?

2 . Teaching Lesson 4-2B: Interpreting Data

1-6.3 Interpret data in picture graphs, object graphs, bar graphs, and tables by using the comparative terms *more, less, greater, fewer, greater than,* and *less than*. (B2)

For this indicator it is **essential** for students to:

- Understand the magnitude of numbers.
- Understand the meaning of the comparative terms

For this indicator it is **not essential** for students to:

- Use symbols <,>, or=

a. Indicators with Taxonomy

1-6.3 Interpret data in picture graphs, object graphs, bar graphs, and tables by using the comparative terms *more, less, greater, fewer, greater than,* and *less than*. (B2)
Cognitive Process Dimension: Understand
Knowledge Dimension: Conceptual Knowledge

b. Introductory Lesson

Advanced Preparation: To save time during the lesson, pair the students up to trace their partner's "writing hand" or dominant hand. The students will trace the hand that they write with the most. (left/right) Instruct the students to write the words right, left or both on the hands. Collect the hands and distribute during the lesson.

c. Materials Needed:

- 1-Piece of construction paper (1/2 sheet) for each child
- 1-Bar Graph drawn on the board or on bulletin board paper. Graph can be horizontal or vertical.
- 1-Roll of tape to tape the hands to the graph
- 1-Chart for tally marks written on the board
- 1 –large piece of paper (one for each group)
- Manipulatives: beans, colors tiles, counters
- Crayons and Markers for each group

During the Lesson:
Ask the students, if we wanted to find out how many people write with their left hand, right hand or both hands, how could we collect that information? Lead the discussion on how to collect data through surveys and etc. Now, ask how can we represent this information? (bar graphs, picture graphs, tables) Ask, what is the

purpose of creating graphs? (to analyze information) Distribute the hands to the students. Instruct the students to come up a few at a time to place their hands on the graph. Afterwards, ask the students questions about their graph:

Do more people write with their right hand or left hand?
How many people write with their right hand?
How many people write with their left hand?
How many people write with both hands?
How many more people write with their right hand than left?
Which hand do people use the least?

Listen to the responses. Divide the children into groups of 4 for the next activity. Instruct each group to decide on something they would like to find out about their classmates. Each group will decide on their topic and how to collect their data. Assist the students in making their graphs; however, allow children to come up with their own ways to represent their information. Distribute manipulatives and materials to help with graph.

Note:
The graphs are important because students will remember things they are interested in. The most important aspect of this lesson is for children to analyze data. After students have completed their graphs, ask groups to come up and present their graphs. Lead the discussion of interpreting the data from the graphs. Be sure to use questions with these terms: more, less, greater, greater than and fewer.

c. Misconceptions/Common Errors

No typical student misconceptions noted at this time.

d. Additional Instructional Strategies/Differentiation

Daily Data Collection:

Write the students' names on craft sticks, place magnetic tape on the back and place them on marker/chalk board. Make a simple graph on the board. Every morning pose a question on the board for the students to answer, for example, favorite color, favorite meal, favorite sport..etc. Instruct the students to come up and answer the question as part of their morning routine. During the day, refer to the graph and discuss the results of the graph with the class.

Resources and Strategies that are used in Indicator 1-6.2 can be extended to be utilized to strengthen this indicator.

Students are more likely to be interested in interpreting data that is relevant to their daily lives. A question can be posed each day related to their favorite color, favorite food, etc… The data can be organized into graph form and analyzed by the students to demonstrate how to carry out the procedure. Later, students can create and interpret their own graphs from the data.

e. Technology

Virtual manipulatives should NOT take the place of concrete manipulation of objects/materials. Once conceptual understanding has been reached, you may move to pictorial representations and then virtual manipulatives. Concrete manipulatives should be the focus of learning to build conceptual understanding. Real life situations/representations are critical for conceptual understanding.

f. Assessing the <u>Lesson:</u>

Formative assessment is embedded within the lesson through questions and observation. However, other formative assessment strategies should be used. *Give the students a graph that can be teacher-made, commercial or one the students have constructed. Ask the students to analyze the data on the graph. Listen to students' responses and make notes.*

These are questions you would want the students to be able to answer during or after the lesson.

Why is it important to be able to interpret graphs?
Why is important to construct graphs?

3. Teaching Lesson 4-2C Basic Prediction – Likely, Unlikely

1-6.4 Predict on the basis of data whether events are likely or unlikely to occur. (B2)

For this indicator it is **<u>essential</u>** for students to:

- Understand that the more an event occurs the more likely that it will happen again.
- Compare quantities

For this indicator it is **<u>not essential</u>** for students to:

- to make predictions on the basis of data whether events are more likely or less likely to occur

a. Indicators with Taxonomy

1-6.4 Predict on the basis of data whether events are likely or unlikely to occur. (B2)
Cognitive Process Dimension: Understand
Knowledge Dimension: Conceptual Knowledge

b. Introductory Lesson:

Adapted from Teaching Student-Centered Mathematics Grades K-3 by Van de Walle and Lovin 2006, Page 333.

Materials Needed:

- One teacher-made spinner for every two students
- Sample chart: See example below
- Chart Paper and markers
- Tape
- Paper clips –two for each spinner
- Poster board or heavy tag board

Teacher Note:

Young children believe in luck and chance, therefore it is important to start with extreme situations. Whenever possible, embed probability within daily lessons using likely or unlikely. Encourage the students to use this terminology.

First grade is the introduction year for students to predict on the basis of data, whether events are *likely* or *unlikely* to occur. This lays the foundation for future work with probability. The term "likely" can be explained as something that probably will happen; and the term "unlikely" as meaning something that probably will not happen. To build readiness for this indicator, the teacher may ask students to think of things at school that are likely to happen today and things that are unlikely to happen today at school. Pictures and sentences should be charted and used in the discussion for readers and non-readers. These charts should be displayed in the room to encourage further discussion and additional ideas. After students relate real events to the terms, they can begin to use information such as data collected every morning and recorded on a weather bar graph to predict which type of weather is likely or unlikely to occur tomorrow.

Hands-on probability activities are excellent ways for students to use data they have collected to make predictions for future outcomes. For example, in a whole group setting, the teacher models this activity describing the steps as she models. Then the teacher gives each pair of students a wooden or foam cube with the numerals 1, 3, 3, 3, 3, 3 written on its faces. After the

students examine the cube and count the numbers on the faces, the teacher asks them to predict which numeral is likely to be rolled, and which numeral is unlikely to be rolled. Each pair of students is given a sheet with a 1-20 number line on it. Students' predictions are made on a handout in crayon by circling the number likely to be rolled and the number unlikely to be rolled from the lists. One child is the "roller" and the other is the "recorder". Each time the cube is rolled, the roller calls out the number, and the recorder writes it on the paper below the number line starting with 1. When the number is recorded, the recorder says "Done" and the roller rolls again. When all 20 rolls have been recorded, the student pairs count how many of each number was rolled and write it on the paper. In their individual math journals they write and draw to explain what happened and whether their predictions were proven. All of the students return to the whole group setting to share their data on a class table. Following the students' interpretation of the data, the teacher asks students their future predictions for this experiment. Will three be rolled the most or will one? Which is likely and which is unlikely? The student pairs, who switch roller and recorder jobs, repeat the experiment. Data is collected in pairs, written about in math journals, and shared with the whole group.

During the lesson:

Explain that today's lesson will deal with probability, with an emphasis of likely in unlikely. Ask the students, what comes to mind, when you think of the word unlikely? Ask the students, what comes to mind when you hear the word likely? Record the responses on the board. Allow the children to continue their discussion to create their own definitions of unlikely and likely.

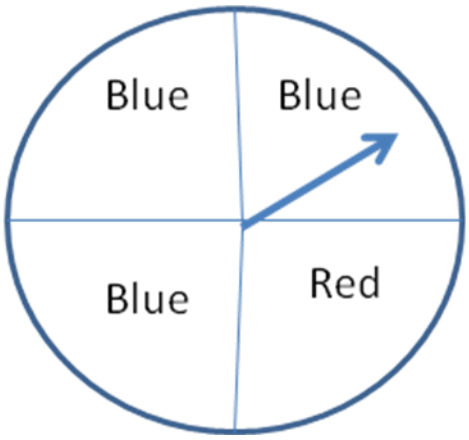
Instruct the students to determine if the following events are likely, or unlikely; the students should explain their reasonable estimate.
It will rain tomorrow.
The dish ran away with the spoon.
The sky will fall today.
The sun will rise tomorrow morning.
You will have three birthdays this year.
Lucy will go to bed at 7:30 tonight.
A pig will dance a jig tonight.
The cow will jump over the moon tonight.

Instruct students to create events that are likely or unlikely. They can construct these in pairs or individually. Afterwards, instruct children to share two of their events. Ask children to show

"thumbs up" if they agree that the event is likely and "thumbs down" if they think the event is unlikely. Observe the students' reactions to the responses.

Play game, "Race to the Top" (Walle and Lovin)
Tell the children they are going to play a game, "Race to the Top." Two students will take turns spinning a spinner with two outcomes. Divide the spinner into two outcomes. Examples: one-fourth red and three-fourths blue, or one-half blue and one-half red.

Example



Each pair will receive a simple recording sheet with ten rows or spaces.
(See example on the next page) Before each game, each student will predict which color will win, red or blue. After each spin, an X is drawn in the appropriate column. Play the game until one color reaches the top of the chart. After all of the games are completed, ask, "Which color won the most times? Why do you think so? If you were to play a second time, do you think the same color would win?" If possible, play again using a variety of spinners with either two regions or more than two regions. With these spinners, students can see how spinners can easily be made to adjust the chances of different outcomes. (Note: If the spinner has 3 colors, the game sheet will then need 3 columns.)

Directions for Spinners:

Adapted from Student-Centered Mathematics K-3, Van de Walle and Lovin, 2006, page 333.

"Draw spinner faces and duplicate them so that you can easily make lots of spinners. Cut out the circles and paste them on tag board or poster board. Allow the student to color the sections of the

spinner. Make a small hole in the spinner center. Unbend one end of a sturdy paper clip and poke this upward from the bottom of the spinner. Tape the paper clip to the back leaving the paper clip post sticking up through the center of the spinner. To use the spinner, students put another paper clip on the post to act as the pointer. Hold the spinner flat to spin fairly." (Van de Walle and Lovin)

Top	Top
Red	Blue
Start	Start

c. Misconceptions/Common Errors

No typical student misconceptions noted at this time.

d. Additional Instructional Strategies/Differentiation

Give each pair of students a penny and a tally sheet. The tally sheet should have columns with heads and tails. Ask the students to predict which side the coin will end up on the most when flipped. The students should take turns flipping the penny 50 trials and record each.

Below are examples of likely and unlikely events.

Likely to Happen Today	**Unlikely to Happen Today**
I will eat lunch today.	I will get a million dollars today.
Someone will use a pencil today.	The computers will all break.
It will be sunny today because there are no clouds in the sky.	It will snow when it is not very cold today.

Is it likely or unlikely that we will have lunch today? Students and teachers should think back on prior experiences and be able to chart that on Monday we had lunch, Tuesday we had lunch, Wednesday we had lunch, so from this information is it likely or unlikely for us to have lunch today on Thursday?

e. *Technology*

"Virtual manipulatives should NOT take the place of concrete manipulation of objects/materials. Once conceptual understanding has been reached, you may move to pictorial representations and then virtual manipulatives. Concrete manipulatives should be the focus of learning to build conceptual understanding. Real life situations/representations are critical for conceptual understanding."

f. Assessing the Lesson:

Interview the students on a one to one basis. Give the students a spinner like the ones used in the lesson. Ask the students , "If you spin this spinner, which color will the arrow most likely land upon? Please explain your answer. Give the students an opportunity to spin the spinner to see if they prediction is correct. Discuss the results with students.

4. Teaching Lesson 4-2D: Quantitative and Qualitative

1-3.6 Classify change over time as quantitative or qualitative. (B2)
For this indicator, it is **essential** for students to:

- identify change by a characteristic (quality or quantity)
- describe the observed change
- identify change in a numeric way

For this indicator, it is **not essential** for students to:

- Students are not expected to be able to measure in standard units to determine quantitative change

- Use the terms qualitative and quantitative

Teacher Notes: First grade is the first time students are formally introduced to the concepts of quantitative and qualitative change. By the end of first grade students should know that when we identify change over time by a characteristic it is qualitative and when we identify change in a numeric way it is quantitative. For example, by the end of the year students should be able to classify "the plant is taller" as a qualitative change (a change in the attribute/characteristic of height) versus the plant grew ten paper clips as the quantitative change (a numeric change in height). Students are not expected to be able to measure in standard units. Students should begin to develop an understanding of the relationship between time and growths –the longer the time, the taller the plant grows – thus change over time.

While this seems to be a simple concept that lacks importance for learning, quite the contrary is true. The concepts of quantitative and qualitative change over time set the foundation for beginning functional relationships.

a. Indicators with Taxonomy

1-3.6 Classify change over time as quantitative or qualitative. (B2)
Cognitive Process Dimension: Understand
Knowledge Dimension: Conceptual Knowledge

b. Introductory Lesson

Materials Needed :

- *1 Clear plastic cup for each student*
- *1 bag of potting soil*
- *4-5 packs of seeds (any kind)*
- *Journal/Notebook for each child to record (can simply staple sheets together and cover them with one sheet of construction paper to make a simple journal)*
- *Newspapers-1 set for each work station*
- *1-large pitcher of water*
- *Optional: crayons for each child*
- *Optional: hand lens*

Teacher Note:

This lesson is best taught while covering the science standard for plants for first grade. The students will plant seeds and observe qualitative and quantitative results. This lesson will continue until the plants begin to grow and the students have had ample opportunities to observe the changes in their plants.

Prior to the Lesson:

Give each group of four students the following materials: seeds, cups, notebooks, potting soil, newspaper. Instruct the children to fill their cups about half full of potting soil. Next, tell them to add the seeds and fill the rest of the cup with potting soil. The students should pat the soil gently to insure that the seeds are covered. Pour a small amount of water on the top. Put the students' names on the cups with a marker. Place plants in a secure place. Conduct first observation 1-2 days later.

During the Lesson:

Begin the lesson by telling the students that they are going to observe their plants. Distribute the students' plants. Instruct the students to open their journals and write the date. Give the students time to observe their plants. Afterwards, instruct them to write down what they have observed and draw a picture. Next, ask the children the following questions:
While you are observing your plant, what are some things that you notice?
How has your plant changed from the first day?
Is your plant taller than the last time you observed it?
Ask these types of questions to address quantitative and qualitative over the next month. It is important that the students are given frequent opportunities over the next month to observe their plants and record observations in journals. Allow the students to compare/contrast plants with peers. Encourage the students to use correct terminology when making comparisons (i.e. "your plant is taller," and "your plant has more petals").

c. Misconceptions/Common Errors :

It is not important for the students to know the terminology "quantitative and qualitative." Students need to be able to observe changes in quantity and quality of items.

Student may confuse the two terms because they sound similar.

d. Additional Instructional Strategies/Differentiation

Classroom Scavenger Hunt: Set up stations around the room. The students will measure with manipulatives at some stations; while at other stations they could describe the relationships between objects instead of numbers.

The types of understanding: For example, by the end of the year students should be able to classify "the plant is taller" as a qualitative change (a change in the attribute/characteristic of height) versus the plant grew ten paper clips as the quantitative change (a numeric change in height).

Students should begin to develop an understanding of the relationship between time and growth – the longer the time, the taller the plant grows – thus the size of the measurement is changing over time.

In first grade, student need to gain a conceptual understand of changes that affect a quantity and changes that affect a quality. In second grade, students identify these types of changes and will be required to use the appropriate terminology.

e. Technology

"Virtual manipulatives should NOT take the place of concrete manipulation of objects/materials. Once conceptual understanding has been reached, you may move to pictorial representations and then virtual manipulatives. Concrete manipulatives should be the focus of learning to build conceptual understanding. Real life situations/representations are critical for conceptual understanding."

f. Assessing the lesson:

Formative assessment is embedded within the lesson through questions and observation. However, other formative assessment strategies should be used.

It is important to ask the children questions to gauge their understanding of quantitative and qualitative.

Set up mini-conferences with the children and ask the students to explain the changes of their plants using their journals. For example, select early versus recent entries in the journal to discuss. Ask the students, "What changes do you notice between the first entry and the last?"

III. Assessing the Module

At the end of this module summative assessment is necessary to determine student understanding of the connections among and between the indicators addressed in this module. The following examples of possible assessment strategies may be modified as necessary to meet student/teacher needs. The examples are not derived from nor associated with any standardized testing.

1-6.1 Use survey questions to collect data. (C3)

The objective of this indicator is use which is in the "apply procedural" knowledge cell of the Revised Taxonomy. Procedural knowledge is a knowledge of specific steps and requires students to know how to do something following a certain method. The learning progression to **use** requires students to understand the expectations of the survey questions. They explain and justify their understanding of the questions to their classmates and their teacher. Students determine a group to whom they will administer the survey based on the type of questions. Students record responses in an appropriate format that is neat and organized. They analyze patterns in the data and may classify information into categories based on their responses. As students use survey questions to collect data they generalize connections among mathematics, the environment, and other subjects (1-1.7). They use a variety of forms of mathematical communication to convey their understanding of the data (1-1.6).

1-6.2 Organize data in picture graphs, object graphs, bar graphs, and tables. (B4)

The objective of this indicator is organize which is in the "analyze conceptual" knowledge cell of the Revised Taxonomy. Analyze requires students to break data into its parts and determine how the parts relate to one another and to an overall structure. Conceptual knowledge is not bound by specific examples; therefore students should be able to organize various amounts of information into different types of graphs and tables. The learning progression to **organize** requires students to analyze patterns in the data and classify information into categories based on the types of responses in the data. Student exchange their ideas (1-1.2) about how the data

should be organized with their classmates and their teachers and explain and justify their reasoning (1-1.3). Students continue to analyze the data and use a variety of forms of mathematical communication to convey their understanding (1-1.6) such as picture graphs, object graphs, bar graphs and tables.

1-6.3Interpret data in picture graphs, object graphs, bar graphs, and tables by using the comparative terms *more, less, greater, fewer, greater than,* and *less than*. (B2)

The objective of this indicator is to interpret which is in the "understand conceptual" knowledge cell of the Revised Taxonomy. To understand is to construct meaning from instructional messages and communication and conceptual knowledge is not bound by specific example; therefore, students interpret data using a variety of examples. The learning progression to **interpret** requires students to recall the meaning of the comparative terms. They analyze the data and determine if any changes have occurred. Students generate conjecture (1-1.2) about the data and exchange those ideas with their classmates and their teacher (1-1.2). They count the total number of entries in each category to determine which category has the most and which has least. They then use comparative terms to describe all categories listed. Students use a variety of forms of mathematical communication (1-1.6) to explain and justify their answers (1-1.3) to their classmates and their teacher.

1-6.4 Predict on the basis of data whether events are *likely* or *unlikely* to occur. (B2)

The objective of this indicator is to predict, which is in the "understand conceptual" knowledge cell of the Revised Taxonomy. To predict is to draw conclusions from presented information. Conceptual knowledge is not bound by specific examples; therefore, students use a variety of examples to make predications. The learning progression to **predict** requires students to recall the meaning of likely and unlikely. Students explore teacher generated examples and generate conjectures (1-1.2) about whether the event is likely or unlikely. They explain and justify their answers (1-1.3) with their classmates and their teacher. Students generalize these mathematical concepts and deepen their conceptual understanding by generating examples of events that are likely and unlikely events.

1-3.6 Classify change over time as quantitative or qualitative. (B2)

The objective of this indicator is to classify which is in the 'understand conceptual" knowledge cell of the Revised Taxonomy. Understand requires student to construct meaning; therefore, student develop an understanding of changes in quality and changes in quantity. The

learning progression to classify requires students to make observations and determine if some change has occurred in a given situation. Students then generate conjectures (1-1.2) about the nature of the change (i.e. it turned brown, it got taller, etc..) and exchange those ideas with their classmates and their teacher. They should explain and justify their answers (1-1.3). After this dialogue, students should clearly describe the change they see. Students are not required to use the terms quantitative or qualitative.

Indicator: 1-6.1 Use survey questions to collect data. (C3)

Instruct the students to walk around the room and survey other students using the chart below. Review how to do tally marks before the survey.

Names of Snacks	***Tally***	***Number of Students***
popcorn		
potato chips		
pretzels		
ice cream		
candy bars		

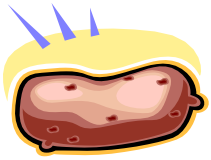
Indicator 1-6.2 Organize data in picture graphs, objects graphs, bar graphs, and tables. (B4)

Instruct the students to take the information above and construct bar/picture graph. (See example below.) Encourage students to create their own graphs.

Snacks Survey				
popcorn	**potato chips**	**pretzels**	**ice cream**	**candy bars**

Indicator 1-6.3 Interpret data in picture graphs, object graphs, bar graphs, and tables by using the comparative terms more, less, greater than, and less than. (B2)

Task: Encourage the students to interpret the graph by using comparative terms more, less, greater, fewer, greater than and less than. If necessary, use the questions below:

Vegetable	Number
	**6**
	**7**
	**4**
	**2**

Which vegetable is the least favorite?
How many fewer people liked broccoli more than turnips?
How many more people chose peas over broccoli?

Note: It is important for the students to look at the graph and make their own interpretations. Observe the observations and record.

Indicator 1-6.4 Predict on the basis of data whether events are likely or unlikely to occur. (B2)

Task:

Give each student a brown paper bag containing 7 colored marbles (use a variety of colors). Instruct the students to take their marbles out and observe them and make predictions on which marbles will be drawn out most and least.

Example:
"Based on the number of red marbles in the bag, I think it is likely that the red marbles will be selected most."
"Based on the number of black marbles in the bag, I think it is unlikely that the black will be selected."

The students should record their results and discuss their results

Task:

Give students a list of statements and ask them to state whether this event is **likely** to occur or **unlikely** to occur.

1. In South Carolina, it will snow in July.
2. The sun will rise tomorrow.
3. Summer will start in June.
4. It will rain tomorrow.
5. A cat will have a conversation with a dog.
6. I will win a car today.
7. There are no clouds in the sky today, it will rain.

Indicator 1-3.6 Classify change over time as quantitative or qualitative. (B2)

Task:

Give the students a plant to observe. Ask students the following questions:

1. What do you notice about the plant?
2. How has the plant changed?
3. How has the plant's color changed?
4. What do you notice about the height of the plant?
5. How does the plant compare to when you first planted it?