SOUTH CAROLINA SUPPORT SYSTEMS INSTRUCTIONAL GUIDE	
Content Area	Kindergarten Mathematics
Recommended Days of Instruction	**Second Nine Weeks**

Standards/Indicators Addressed:

Standard K-2: The student will demonstrate through the mathematical processes an emerging sense of quantity and numeral relationships, sets, and place values.

K-2.1* Recall numbers, counting forward through 99 and backward from 10. (A1)
K-2.2* Translate between numeral and quantity through 31. (B2)
K-2.3* Compare sets of no more than 31 objects by using the terms *more than, less than*, and *the same as.* (B2)
K-2.6* Analyze the magnitude of digits through 99 on the basis of their place values. (B4)
K-2.7* Represent the place value of each digit in a two-digit whole number. (B2)
K-2.8* Identify ordinal positions through 31st. (A1)

Standard K-3: The student will demonstrate through the mathematical processes an emerging sense of repeating and growing patterns and classification based on attributes.

K-3.1* Identify simple growing patterns. (B1)
K-3.2* Analyze simple repeating and growing relationships to extend patterns. (B4)
K-3.3* Translate simple repeating and growing patterns into rules. (B2)
K-3.4* Classify objects according to one or more attributes such as color, size, shape, and thickness. (B2)

Standard K-5: The student will demonstrate through the mathematical processes an emerging sense of coin values and the measurement concepts of length, weight, time, and temperature.

K-5.1* Identify a penny, a nickel, a dime, a quarter, and a dollar and the value of each. (A1)
K-5.6* Use analog and digital clocks to tell time to the hour. (C3)
K-5.7* Use a calendar to identify dates, days of the week, and months of the year. (A3)
K-5.8* Recall equivalencies associated with time: 7 days = 1 week and 12 months = 1 year. (A1)

* These indicators are covered in the following 4 Modules for this Nine Weeks Period.
Teaching time should be adjusted to allow for sufficient learning experiences in each of the modules.

Module 2-1 Number Structure and Relationships- Whole Numbers / Calendar			
Indicator	**Recommended Resources**	**Suggested Instructional Strategies**	**Assessment Guidelines**
Module 2-1 Lesson A: Counting K-2.1 Recall numbers, counting forward through 99 and backward from 10. (A1)	NCTM's Online Illuminations http://illuminations.nctm.org NCTM's Navigations Series SC Mathematics Support Document Teaching Student-Centered Mathematics Grades 5-8 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 2-1 Introductory Lesson A See Instructional Planning Guide Module 2-1, Lesson A Additional Instructional Strategies	See Instructional Planning Guide Module 2-1 Lesson A Assessment
Module 2-1 Lesson B: Matching Numeral and Quantity K-2.2 Translate between numeral and quantity through 31. (B2)		See instructional Planning Guide Module 2-1 Introductory Lesson B See Instructional Planning Guide Module 2-1, Lesson B Additional Instructional Strategies	See Instructional Planning Guide Module 2-1 Lesson B Assessment

Module 2-1 Lesson C: Comparing Sets K-2.3 Compare sets of no more than 31 objects by using the terms *more than, less than*, and *the same as.* (B2)		See instructional Planning Guide Module 2-1 Introductory Lesson C See Instructional Planning Guide Module 2-1, Lesson C Additional Instructional Strategies	See Instructional Planning Guide Module 2-1 Lesson C Assessment
Module 2-1 Lesson D: Ordinal Numbers K-2.8 Identify ordinal positions through 31st.		See instructional Planning Guide Module 2-1 Introductory Lesson D See Instructional Planning Guide Module 2-1, Lesson D Additional Instructional Strategies	See Instructional Planning Guide Module 2-1 Lesson D Assessment
Module 2-1 Lesson E: Place Value K-2.6 Analyze the magnitude of digits through 99 on the basis of their place value. K-2.7 Represent the place value of each digit in a two-digit whole number. (B2)		See instructional Planning Guide Module 2-1 Introductory Lesson E See Instructional Planning Guide Module 2-1, Lesson E Additional Instructional Strategies	See Instructional Planning Guide Module 2-1 Lesson E Assessment

Module 2-1 Lesson F: Using a Calendar K-5.7 Use a calendar to identify dates, days of the week, and months of the year. (A3) K-5.8 Recall equivalencies associated with time: 7 days=1 week and 12 months=year (A1)	NCTM's Online Illuminations http://illuminations.nctm.org NCTM's Navigations Series SC Mathematics Support Document Teaching Student-Centered Mathematics Grades 5-8 and Teaching Elementary and Middle School Mathematics Developmentally 6th Edition, John Van de Walle Van de Walle website: www.ablongman.com/vandewalleseries NCTM's Principals and Standards for School Mathematics (PSSM) Hands On Standards Grade PreK-K and 1-2, Learning Resources	See Module 2-1, Lesson F Additional Instructional Strategies See Instructional Planning Guide Module 2-1, Lesson F Additional Instructional Strategies	See Module 2-1, Lesson F Additional Instructional Strategies
Module 2-2 Patterns, Relationships and Functions			
Indicator	**Recommended Resources**	**Suggested Instructional Strategies**	**Assessment Guidelines**

Module 2-2 Lesson A: Sorting by One Attribute K-3.4 Classify objects according to one or more attributes such as color, size, shape, and thickness. **(B2)**	NCTM's Online Illuminations http://illuminations.nctm.org NCTM's Navigations Series SC Mathematics Support Document Teaching Student-Centered Mathematics Grades 5-8 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 2-2 Introductory Lesson A See Instructional Planning Guide Module 2-2, Lesson A Additional Instructional Strategies	See Instructional Planning Guide Module 2-2 Lesson A Assessment
Module 2-2 Lesson B: Repeating Patterns K-3.2 Analyze simple repeated and growing relationships to extend patterns. **(B4)**		See instructional Planning Guide Module 2-2 Introductory Lesson B See Instructional Planning Guide Module 2-2, Lesson B Additional Instructional Strategies	See Instructional Planning Guide Module 2-2 Lesson B Assessment
Module 2-2 Lesson C: Translate Repeating Patterns K-3.3 Translate simple repeating and growing patterns into rules. **(B2)**		See instructional Planning Guide Module 2-2 Introductory Lesson C See Instructional Planning Guide Module 2-2, Lesson C Additional Instructional Strategies	See Instructional Planning Guide Module 2-2 Lesson C Assessment

Module 2-2 Lesson D: Growing Patterns K-3.1 Identify simple growing patterns. (B1)		See instructional Planning Guide Module 2-2 Introductory Lesson D See Instructional Planning Guide Module 2-2 , Lesson D Additional Instructional Strategies	See Instructional Planning Guide Module 2-2 Lesson D Assessment
Module 2-2 Lesson E: Extending Growing Patterns K-3.2 Analyze simple repeated and growing relationships to extend patterns. (B4)		See instructional Planning Guide Module 2-2 Introductory Lesson E See Instructional Planning Guide Module 2-2 , Lesson E Additional Instructional Strategies	See Instructional Planning Guide Module 2-2 Lesson E Assessment
Module 2-2 Lesson F: Translate Growing Patterns K-3.3 Translate simple repeating and growing patterns into rules. (B2)		See instructional Planning Guide Module 2-2 Introductory Lesson F See Instructional Planning Guide Module 2-2 , Lesson F Additional Instructional Strategies	See Instructional Planning Guide Module 2-2 Lesson E Assessment

Module 2-3 Time to the Hour			
Indicator	**Recommended Resources**	**Suggested Instructional Strategies**	**Assessment Guidelines**
Module 2-3 Lesson A: Time to the Hour K-5.6 Use analog and digital clocks to tell time to the hour. (C3)	NCTM's Online Illuminations http://illuminations.nctm.org/ NCTM's Navigations Series SC Mathematics Support Document Teaching Student-Centered Mathematics Grades 5-8 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 Everyday Mathematics Kindergarten, McGraw Hill	See instructional Planning Guide Module 2-3 Introductory Lesson A See Instructional Planning Guide Module 2-3, Lesson A Additional Instructional Strategies	See Instructional Planning Guide Module 2-3 Lesson A Assessment

Module 2-4 Coin Identification and Value			
Indicator	**Recommended Resources**	**Suggested Instructional Strategies**	**Assessment Guidelines**
Module 2-4 Lesson A: Identifying Coins and	NCTM's Online Illuminations http://illuminations.nctm.org/	See Instructional Planning Guide Module 2-4 Lesson A	See Instructional Planning Guide

Values K-5.1 Identify a penny, a nickel, a dime, a quarter, and a dollar and the value of each (A1)	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 2-4, Lesson A Additional Instructional Strategies	Module 2-4 Lesson A Assessment

MODULE

2-1

Number Structure and Relationships- Whole Numbers

Calendar

(Year-long Indicators)

This module addresses the following indicators:

K-2.1 Recall numbers, counting forward through 99 and backward from 10. (A1)
K-2.2 Translate between numeral and quantity through 31. (B2)
K-2.3 Compare sets of no more than 31 objects by using the terms *more than, less than*, and *the same as.* (B2)
K-2.6* Analyze the magnitude of digits through 99 on the basis of their place values. (B4)
K-2.7* Represent the place value of each digit in a two-digit whole number. (B2)
K-2.8 Identify ordinal positions through 31st. (A1)
K-5.7 Use a calendar to identify dates, days of the week, and months of the year. (A3)
K-5.8 Recall equivalencies associated with time: 7 days = 1 week and 12 months = 1 year. (A1)

Module 2-1 consists of 6 lessons that continue to develop concepts introduced in Module 1-1 and Module 1-4. These 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 student's prior knowledge and/or skills related to the standard. It is recommended that students are pre-assessed on this prior knowledge.

Continuum of Knowledge

K-2.1 Recall numbers, counting forward through 99 and backward from 10.

- Pre-Kindergarten students have some foundation for counting. They are motivated to count everything from the treats they eat to the stairs they climb.
- In First grade, students will use estimation to determine the approximate number of objects in a set of 20 to 100 objects (1-2.2) and compare whole-number quantities through 100. (1-2.5)

K-2.2 Translate between numeral and quantity through 31.

- Pre-Kindergarten students come to school counting up to five using a one-to-one correspondence as they share items during playtime (i.e., sharing cookies as they count 1,2,3,4 and 5). They may not understand the standard numeral 5 to represent the number of cookies shared.
- In First grade, students will translate between numeral and quantity to 100(1-2.1) and represent quantities in word form through ten. (1-2.3)

K-2.3 Compare sets of no more than 31 objects by using the terms *more than*, *less than*, and *the same as*.

- Pre-Kindergarten students have beginning concepts of size with sets of objects. They understand when someone has more cookies than they do, more blocks than they have, etc…
- In First grade, students will compare whole number quantities through 100, *is greater than, is less than,* and *is equal to* (1-2.5) and use estimation to determine the approximate number of objects in a set. (1-2.2)

K-2.6 Analyze the magnitude of digits through 99 on the basis of their place values.

- Pre-kindergarten students come to school rote counting and have very little understanding of numbers having an assigned place.
- In First grade, students will represent quantities in word form through 10 (1-2.3), recognize whole-number words (1-2.4) and analyze the magnitude of digits through 999 on the basis of their place values. (1-2.9)

K-2.7 Represent the place value of each digit in a two-digit whole number.
No continuum of knowledge is included in the support document at this time.

K-2.8 Identify ordinal positions through 31st.
No continuum of knowledge is included in the support document at this time.

K-5.7 Use a calendar to identify dates, days of the week, and months of the year. (A3)

- Pre-kindergarten students experience marking birthdays on calendars, singing songs about the days of the week and months of the year.
- In First grade, students will illustrate past and future dates on a calendar (1-5.9) and represent dates in standard form (i.e., June 1, 2009) and numeric form (i.e., 6-1-2009). (1-5.10)

K-5.8 Recall equivalencies associated with time: 7 days = 1 week and 12 months = 1 year

- Pre-kindergarten students experience counting days on a calendar while singing rote songs for the days of week and months of the year.
- In First grade, students will illustrate past and future dates on a calendar (1-5.9) and represent dates in standard form (i.e., June 1, 2007) and numeric form (i.e., 6-1-2007). (1-5.10)

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.*

Number Structure and Relationships

Quantity	More than*	Less than*
The same as*	Digit	Forward
Backward	After*	Before*
Numeral	Counting	Quantity
Compare	Sets	Place Value
Tens*	Ones*	Size

Calendar

Dates	Days*	Week*
Months *	Year*	Equal*
Yesterday*	Today *	Tomorrow*

7 days= 1 week* 12 months=1 year*

Days of the week (Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, and Sunday)*
Months of the year (January, February, March, April, May, June, July, August, September, October, November, and December)*

II. Teaching the Lesson(s)

These lessons continue to develop the concepts that were introduced in Module 1-1 and Module 1-4.

1. Teaching Lesson A: Counting

Teacher Notes

Since there is a developmental progression from counting to understanding place value, it is important to break the numbers 0-99 into smaller, more manageable groups for students to work with. It is for this reason that the first nine weeks has been designated to working with 0-10, **the second nine weeks 1-20**, the third nine weeks 0-99. The fourth nine weeks will focus on joining and separating

a. Indicators with Taxonomy

K-2.1 Recall numbers, counting forward through 99 and backward from 10. (A1)
Cognitive Process Dimension: Remember
Knowledge Dimension: Factual Knowledge

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

- Understand how to count using a number line or number chart.
- Recognize the counting numbers and be able to rote count.
- Say the counting words in order and then connect this sequence with a one-to-one match of the items being counted.
- Recognize counting objects in a different order does not alter the result.
- Recognize the next number in the counting sequence is one more than the number just named.

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

- Recognize three digit numbers, which students will translate in first grade.
- Add and subtract two digit numbers.

b. Introductory Lesson

(Adapted from Teaching Student Centered Mathematics Grades K-3, Van de Walle, John A. and Lovin, LouAnn, Pearson Learning, 2006, Pages 40.)

Materials Needed

- None

Suggested Literature Connection:

3, 2, 1, Go! : a Transportation Countdown by Sarah L. Schuette. Counts backwards from 10.

Introductory Lesson A: Counting

In Module 1-1, students counted up to a target number between 0-10 and then counted back down to zero.
In this module, choose a target number between 0-20.

Gather a set of classroom objects that corresponds to the target number. Have one child at a time pick up an object and go stand in a line. As a class, count orally in rhythmic fashion from 0 to the target number. Have 10 students remain, holding their objects. Have students count backwards from 10 as they return to their seats.

c. Misconceptions/Common Errors

- Students who are able to count forward easily may have difficulty counting on and counting back.
- Although, many children come to school with the ability to rote count and recognize some numbers, they may not have developed a good sense of number.
- Students may omit numbers when counting objects and struggle to recount them for accuracy.
- Recall of the first twelve numbers involves no pattern or repetition, and many children do not recognize a pattern in the teens.

d. Additional Instructional Strategies/Differentiation

- ***To differentiate for those having difficulty with counting and one-to-one correspondence:*** Have students place counters on a grid mat to count up to a target number from 0-20. After they place the counters to count up, have them remove the counters one at a time while counting down from 10.
- Students should have a fair understanding of counting, but children must construct this idea. It cannot be forced. Only the counting sequence is a rote procedure. There should be *meaning* attached to counting. That is the key concept upon which all other number concepts are developed.
- Saying the counting words in order with a one-to-one correspondence takes a lot of practice and should be done with a variety of concrete items.
- Teachers should use frequent short practice drills to develop counting on and counting back with their students and use naturally occurring opportunities to help them develop number concepts. Teachers may pose questions; such as, "How many pencils do we need at this table?" "How many students are in line ahead of you?"

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.

http://illuminations.nctm.org/WebResourceReview.aspx?ID=54
Lesson plan for numeral recognition, matching and writing of numerals 0-20.

f. Assessing the Lesson

As the children work in centers, individually observe for the following areas:

- ability to count in correct sequence forwards to 20 and backwards from 10
- use one to one correspondence when counting.

2. Teaching Lesson B: Numeral and Quantity

Teacher Notes

Beginning number concepts encompass much more than rote memorization of words and symbols. Since kindergarten students have generally had experiences with things they can see and feel, developing a concept of number sense requires a new dimension of thinking as numbers are an idea that can't be seen or felt.

To develop these concepts, kindergarten students need repeated exposures to activities with authentic materials and given extensive opportunities to count in meaningful situations, match numbers to their quantities, and explore number decomposition

a. Indicators with Taxonomy

K-2.2 Translate between numeral and quantity through 31. (B2)
Cognitive Process Dimension: Understand
Knowledge Dimension: Conceptual Knowledge

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

- Understand that number words refer to a quantity.
- Recognize numerals through 31.

- Say the counting words in order and then connect this sequence with a one-to-one match of the items being counted.

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

- Recognize three digit numbers, which students will translate in first grade.
- Add and subtract two digit numbers for this indicator.

b. Introductory Lesson

(Adapted from Hands On Standards Grades PreK-K, Learning Resources. 2006, Pages 18-19 .)

Materials Needed

- Interlocking Cubes
- Cards, labeled 0-20 with corresponding number of dots (one set per pair of students)
- Blank index cards (5 per pair of students)

Suggested Literature Connection:

Ten Black Dots by Donald Crews is a counting book with simple rhymes.

Introductory Lesson B: Numeral and Quantity

In Module 1-1, students represented the numerals 0-10 with cubes. In this module, students will choose a target number between 0-20.

Provide each pair of students with cubes and number cards. Have the students place the number cards (0-15) facedown. To begin, have one child pick a number card and work with their partner to make a group of cubes to represent the number. Have the students switch roles so the other student chooses a number card and repeats the process. The students will continue working until all the number cards have been used.

Depending on your class, this lesson could be extended so students are working with target numbers greater than 15.

c. Misconceptions/Common Errors

- Students who are able to count forward easily may have difficulty counting on and counting back because these are difficult skills for many.
- Although, many children come to school with the ability to rote count and recognize some numbers, they may not have developed a good sense of number.

d. Additional Instructional Strategies/Differentiation

- **Enrichment:** To differentiate for students who are able to make groups for numbers, you may have them write the corresponding numeral on a blank index card during this activity.
- **Remediation**: Prepare sets of Dot Cards from Van de Walle's Blackline Masters (*technology link listed below*). Use these with students to practice matching numeral and quantity. These cards are also good to help students recognize a dot pattern for a number without counting
- Teachers should represent numbers in multiple ways: by pictures, objects, or models to help students develop conservation of numbers.

e. Technology

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www.ablongman.com/vandewalleseries
Volume 1 Blackline Masters: Use masters 3-8 for dot cards

http://illuminations.nctm.org/ActivityDetail.aspx?ID=75
Interactive Ten Frame to practice counting and thinking of numbers in relation to 10. (Use the games the following games: "How Many?" and "Build")

f. Assessing the Lesson

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

As the students are working, watch for students who cannot create a group for a specific number. Have those students count forward from 1 as they touch each cube. Also watch for children who count the same cube twice. These children need to put the cubes in a line and count from left to right.

3. Teaching Lesson C: Comparing Sets

Teacher Notes

When comparing sets of objects teachers using the terms *more than, less than, and the same as,* teachers need to provide many opportunities for children to construct sets using concrete items and help them make comparisons of the sets each containing 31 or fewer items.

a. Indicators with Taxonomy

K-2.3 Compare sets of no more than 31 objects by using the terms *more than, less than*, and *the same as.* (B2)

Cognitive Process Dimension: Understand
Knowledge Dimension: Conceptual Knowledge

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

- Recognize the counting numbers and connect them to the number of objects
- Compare whole number quantities and sets of objects using the comparative vocabulary *more than, less than,* or *the same as*.
- Select which set of objects has more than or less than a number

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

- Identify how much more or how much less than a number. (Ex. Teacher asks, "Which group has more?" showing a group of 5 objects and a group of 15. The child does not need to say the group of 15 has 10 more than the group of 5.)

b. Introductory Lesson

Materials Needed

- Colored counters

Suggested Literature Connection (if any):

Just Enough Carrots by Stuart Murphy is a fun tale of comparing groups with a trip to the grocery store for rabbit.

Introductory Lesson C: Comparing Sets

In Module 1-1, students compared sets with 5 or fewer objects and identified which sets had more or less.
In this module, students will continue to compare sets but work with sets that contain 0-15 objects.

Give each student a set of 15 or fewer colored counters (Suggested counters include teddy bears, chips, pattern blocks, etc). Have them

sort their counters by color. Ask students to count how many they have of each color. Call on two students to tell how red bears they have. Ask the class to compare the number of bears named. Who has more, who has less, or do they have the same (=)? Continue with all colors. [Anderson 5]

c. Misconceptions/Common Errors

- Some children may confuse the terms more, fewer and equal. Reinforce these terms throughout the day by pointing out real life experiences such as that more children are in their chairs than are sitting on the floor.
- Students have more difficulty comparing sets using the term "less than" and may have more difficulty counting back
- Although many children come to school with the ability to rote count and recognize some numbers, they may not have developed a good sense of number.
- Students may omit numbers when counting objects and struggle to recount them for accuracy.

d. Additional Instructional Strategies/Differentiation

- **Remediation Activity**: (from Developing Number Concepts, Book 1 by Kathy Richardson, page 35) Give students a card with ten dots and some counters. Name a number, "4". Have students place that many counters on their card, one counter per dot. Name another number, "7", and have students show that number. Continue naming numbers. Notice how the students approach this task. Do they remove all the counters each time? This activity should be repeated frequently for students having difficulty with counting and comparing sets. Gradually, students will understand that if the next number is more, they can just add-on. If the next number is less, they can take counters off.
- Teachers need to provide many opportunities for children to construct sets using concrete items and help them make comparisons of the sets each containing 31 or fewer items. This involves counting groups using one-to-one correspondence. It is especially helpful to connect this concept to everyday situations in the lunch room, bathroom breaks, lining up and so forth.
- Students should have a fair understanding of counting, but children must construct this idea. It cannot be forced. Only the counting sequence is a rote procedure. There should be *meaning* attached to counting. That is the key concept upon which all other number concepts are developed.
- Students have difficulty selecting a set when asked, "Which is less?". Teachers can help by asking students which is less immediately after which set is more. Ask students why is this set less than the other set? Begin by asking students to compare sets

that are obviously different in number, then proceed to closer values.

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 questioning and observation. However, other formative assessment strategies should be employed.

As students are comparing sets, watch for students who are still making errors when counting the objects, either skipping a number or counting an object twice. When students compare two groups of objects or stacks of cubes, observe that students are correctly matching the objects in one-to-one correspondence to know which group has more or less. Since students have more difficulty in understanding the concept of "less" ask questions similar to these:
"Which group has less than the other?"
"Which group has fewer objects?"

4. Teaching Lesson D: Ordinal Numbers

Teacher Notes

Ordinal numbers are primarily taught through the tenth place especially when using straws and other objects to represent base ten numerals. The calendar, however, is a great tool for exploring ordinal numerals beyond ten and through 31 as the students learn to identify the days of the week / month.

a. Indicators with Taxonomy

K-2.8 Identify ordinal positions through 31st. (A1)

Cognitive Process Dimension: Remember
Knowledge Dimension: Factual Knowledge

b. Introductory Lesson

(Adapted from Hands On Standards Grades PreK-K, Learning Resources, 2006, Pages 34-35)

Materials Needed

- Unifix cubes (different colors)

Introductory Lesson D: Ordinal Numbers

In Module 1-1, students worked with ordinal numbers for the first through fifth positions.
This module extends the use of ordinal numbers to higher positions.

Have students work with a partner. Ask students to place 10-12 unifix cubes in a line on their desk or table. Have students count the cubes using the cardinal numbers (1, 2, 3 …). Then have them count the cubes using the ordinal numbers (first, second, third…).
Why would we want to use ordinal numbers to count objects?
Students' answers should indicate an awareness of the use of ordinals to indicate position.
Have students point to a cube and name its position. Next, the teacher should name a position (Which cube is in the ninth spot?) and let the students describe the cube in that position.
Students may then take turns asking similar questions to the partners. The teacher should observe whether students know where to begin counting and whether the students know the ordinal words through at least the twelfth position.

c. Misconceptions/Common Errors

Children may be confused about which link/cube is the beginning and which is the end. Encourage children to work from left to right similar to the way they read a sentence.

d. Additional Instructional Strategies/Differentiation

While additional learning opportunities are needed, no suggestions are included at this time.

e. Technology

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http://www.primarygames.com/squigly/start.htm
Interactive Game: Click the ordinal number that tells which apple Squigly the Worm is hiding.

f. Assessing the Lesson

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

As the teacher questions the students about ordinal positions of cubes in the trains they make with the unifix cubes, observe whether students know where to start as they begin to count. Listen to see if students are saying the ordinal numbers in the correct order.

Suggested questions:
Which cube is eighth? Show me how you know that.
What place is the red cube in?
What color comes after the eleventh cube?

5. Teaching Lesson E: Place Value

Teacher Notes

Kindergarteners must develop the concept of place value only after they have secured a firm understanding of number. They should not be expected to understand place value until they have mastered the one-to-one correspondence and matching numerals to groups of objects less than 10.

With regard to place value students need to understand that the digit to the left in a two-digit number is representing groups of ten and the digit to the right is representing how many are in the ones place that have not yet made a group of ten. It can take the entire school year for many kindergarten students to grasp this concept. For this reason, it is recommended that students work with place value for numerals 0-25 during the first nine weeks, **25-50 during the second nine weeks**, 50-75 during the third nine weeks, and 75-99 during the fourth nine weeks.
The concept should be taught everyday and especially taught with manipulatives that the students can use to demonstrate their understanding. For example, a child may show a tower of ten cubes and a tower of three cubes to represent the numeral 13 or 3 towers of ten and a single cube to represent 31. Do not expect students to understand this concept until after mastering the one-to-one correspondence and matching numerals to groups of objects.

a. Indicators with Taxonomy

K-2.6 Analyze the magnitude of digits through 99 on the basis of their place values. (B4)
Cognitive Process Dimension: Analyze
Knowledge Dimension: Conceptual Knowledge

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

- Develop *meaning* attached to their counting.
- Recognize sets of tens in objects.
- Understand the one to one correspondence of numbers.
- Understand the digit to the left in a two-digit number is representing groups of ten and the digit to the right is representing how many are in the ones place that has not yet made a group of ten.
- Recognize and understand the meaning of "ten-ness".
- Determine how greater numbers in the tens place increase the value of the total number regardless of the numeral in the ones place being of less value.

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

- Analyze digits beyond 100 because it will later be addressed in first grade.
- Compute the numbers to increase place values (i.e., 34 plus one more ten is equal to 44).

K-2.7 Represent the place value of each digit in a two-digit whole number (B2)
Cognitive Process Dimension: Understand
Knowledge Dimension: Conceptual Knowledge

There is currently no essential and nonessential information in the support document for this indicator.

b. Introductory Lesson

Materials Needed

- Number line 0-50
- Bundles and singles of straws or craft sticks

Introductory Lesson E: Place Value

In Module 1-1, students worked with understanding the place value using the number 0-25.
In this module, students will work with place value using the numbers 25-50.

Have children refer to the classroom number line (this can be a commercial number line or the growing number line for the day of the school year). Alternate between calling out a number between 25-50 and having the students point to the number or letting a child point to a random number and asking another child to name it.

Focus on the section of number line between 30-40 or 40-50. *How are these numbers the same? How are they different?*
Give students bundles of straws or craft sticks and individual straws/sticks. Point to a number on the number line. Have children represent the number using bundles and singles of straws/craft sticks. (If this is part of your calendar routine, help students make that connection.) Let the students count by 10s and 1s to make sure they have the correct amount of straws for the number.
Continue having students model numbers with their straws. You may also model a number for the students and have them count the bundles and singles and then locate the number on the number line. Ask the following questions to assess whether students are making connections between the concrete representation and the symbolic numeral:
What do you notice about the number 35 and your bundles and singles of straws? If I point to the number 27, how many bundles would you need? How many single straws?

c. *Misconceptions/Common Errors*

- Although, many children come to school with the ability to rote count and recognize some numbers, they may not have developed a good sense of number.
- Students may not understand the concept of place value until after mastering the one-to-one correspondence and matching numerals to groups of objects.
- Students who have not yet developed sense of number might hold the misconception that the number 16 is made up of one and six rather than one ten and six ones.

d. *Additional Instructional Strategies/Differentiation*

- Teachers may use the hundreds mat to show how numbers change in the tens and ones place.
- The concept should be taught daily using the number of days in school with a variety of manipulatives that the students can use to demonstrate their understanding (i.e., a student may show a tower of ten cubes and a tower of three cubes, or sticks and bundles) to represent the numeral 13 or 3 towers of ten and a single cube to represent 31.)
- Students that struggle to understand numbers and operations concepts often just need another approach coupled with repetition. Using different manipulatives and connecting the learning to individual interests can help.

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 questioning and observation. However, other formative assessment strategies should be employed.

As students model numbers between 25 and 50 with the bundles and singles of straws / craft sticks, observe whether they are treating both digits as if they are in the ones place. (35 means 3 straws + 5 straws) If students have this misconception, have them count out 35 individual straws and then fill bundle them with a rubber band. How many bundles of 10 do they have? How many straws are left over? What does the digit 3 in the number 35 mean?

6. Teaching Lesson F: Using a Calendar

Teacher Notes

Kindergarten students should use a calendar to identify dates, days of the week, and months of the year. While students can learn these facts from rote memory, they need to understand the deeper meaning of connections between these larger amounts of time.

Teachers must connect the repetition of the days and months so that students can understand the continual cycle of weeks and years. By doing so, students will be able to understand transitions Saturday to Sunday and December to January.

a. Indicators with Taxonomy

K-5.7 Use a calendar to identify dates, days of the week, and months of the year. (A3)
Cognitive Process Dimension: Apply
Knowledge Dimension: Factual Knowledge

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

- Understand the order of the months and days of the week.
- Recognize the vocabulary used to indicate positional days (i.e., Today is ___, tomorrow will be _____, and yesterday was _____).

- Recognize a row on the calendar is one week.
- Understand that each box on a calendar represents a day.
- Name and locate the month on a calendar.

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

- Determine the number of months between to given ones (i.e., "How many months are there before December, if this month is April?")
- Illustrate past dates using the calendar (i.e., "If today is June 2, what day was it three months ago?") In first grade, they will illustrate past and future dates on a calendar.

K-5.8 Recall equivalencies associated with time: 7 days = 1 week and 12 months = 1 year. (A1)

Cognitive Process Dimension: Remember
Knowledge Dimension: Factual Knowledge

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

- Understand what equal means when it applies to time.
- Recognize the vocabulary as it relates to equivalency (i.e., all 12 months equals a year).
- Recognize a row on the calendar is one week.
- Recognize that some calendars begin on different days of the week.

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

- Recognize the number of days in several weeks or number of months in several years.
- Determine smaller amounts of time (i.e., 1 day = 24 hours, etc.).

b. Introductory Lesson

Materials Needed:

- *A completed class calendar with dates, days, and the month in place*

Suggested Literature Connection:

All about the Months by Joanne Randolph uses photographs and rhyming text to introduce the twelve months of the year.

Introductory Lesson F: Using a Calendar

In Module 1-1, students went through the process of building a calendar for the month, placing the days of the week in order, identifying and labeling the month, and identifying dates.

In this module, students will dismantle the calendar to prepare for the nest month.

Teacher Note: If Possible, plan to do this lesson on the last day of the month.

This lesson will be done whole group with the group sitting together close to the calendar. In preparation for the new month, have the students help in taking down the calendar. *This activity will provide practice in number skills and calendar awareness.* To dismantle the calendar, give clues that direct the students to clear specific dates from the calendar. Here are some suggested clues:
Remove, erase, or cover…

- The first Friday
- The third day of the month
- All the dates in the second week
- The name of the month
- The year
- The day of the week that comes after Friday
- All the Tuesdays
- A number between 5 and 10
- A teen number
- Sam's birthday
- A number you can read

This activity should be done at the end of each month. Change the clues as the year progresses and children become more familiar with the calendar and develop their number sense. Clues for later in the year:

- Two days whose sum is 9
- A number that has 2 tens and 3 ones
- All the days with a 4 in the ones place

c. Misconceptions/Common Errors

- Students may have difficulty understanding the concept of week, month or year.
- Students may have difficulty recognizing days before and after a certain date on a calendar (i.e., "Yesterday was __.", etc…).
- Students may have difficulty associating whole numbers with ordinal numbers. For example, the number 1 is dated on a calendar as the 1st.

d. Additional Instructional Strategies/Differentiation

- Teachers must connect the repetition of the days and months so that students can understand the continual cycle of weeks, months and years. By doing so, students will be able to understand transitions Saturday to Sunday and December to January.
- Refer to Module 1-1 for songs and poems related to the days of the week and months of the year
- Teachers may color code every other week on the calendar to help students understand the concept of a week

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."

http://www.jmeacham.com/calendar/calendar.htm
A resource page for teachers. Calendar songs, SMART Notebook monthly calendar lessons, and other ideas for teaching the calendar.

f. Assessing the lesson:
Display a copy of the calendar and ask the students some questions about the days of the week and months of the year.

- What is today's date?
- What day is today?
- What month is it?
- What was yesterday?

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.

Assessment Guidelines

K-2.1 Recall numbers, counting forward through 99 and backward from 10.

The objective of this indicator is recall, which is in the "remember factual" knowledge cell of the Revised Taxonomy table. Remember requires students to retrieve relevant knowledge from long-term memory. Factual knowledge is having the knowledge of specific details and elements. Students should recall

numbers, counting forward through 99 and backward from 10. The learning progression to **recall** requires students to recognize the counting numbers and recall their order in the sequence. Students should analyze (K-1.4) patterns by reasoning and use (K-1.8) multiple informal representations as they apply (K-1.1) substantive mathematical problem-solving strategies to explore hands-on activities.

K-2.2 Translate between numeral and quantity through 31.

The objective of this indicator is translate, which is in the "understand conceptual" knowledge cell of the Revised Taxonomy table. Understand requires students to construct meaning from instructional messages. Conceptual knowledge is having the knowledge of classifications and categories. The learning progression to **translate** requires students to recall counting numbers through 31, recognize the one-to-one correspondence as they count and determine the numeral and quantity of the objects given. They use these multiple informal representations (K-1.8) as they apply mathematical problem-solving strategies (K-1.1). Students should use a variety of forms of mathematical communication (K-1.6) as they explain and justify their answers (K-1.3)to their classmates and their teacher..

K-2.3 Compare sets of no more than 31 objects by using the terms *more than, less than*, and *the same as.*

The objective of this indicator is compare, which is in the "understand conceptual" knowledge cell of the Revised Taxonomy table. Understand requires students to construct meaning from instructional messages, including oral, written, and graphic communication. Conceptual knowledge is having the knowledge of theories, models, and structures. The learning progression to **compare** requires students to recognize the counting numbers and recall their order in the sequence. Students should understand sets and categorize groups by quantity. Students should use multiple informal representations (K-1.8) as they apply (K-1.1) mathematical problem-solving strategies to compare objects.

K-2.6 Analyze the magnitude of digits through 99 on the basis of their place values.

The objective of this indicator is to analyze, which is in the "analyze conceptual" knowledge cell of the Revised Taxonomy table. Analyze requires students to break material into its constituent parts and determine how the parts relate to one another and to the overall structure. Conceptual knowledge is having the knowledge of finding the interrelationships among the basic elements within a larger structure that enable them to function together. The learning progression to **analyze** requires students to remember the counting numbers and differentiate between the larger and smaller numbers. Students analyze patterns (K-1.4) in the place value of the

number and generalize (K-1.7) connections about the size of digit in the tens place versus digits in the ones place.

K-2.7* Represent the place value of each digit in a two-digit whole number.

No assessment guidelines are available at this time.

K-2.8 Identify ordinal positions through 31st.

No assessment guidelines are available at this time.

K-5.7 Use a calendar to identify dates, days of the week, and months of the year.

The objective of this indicator is use, which is in the "apply factual" knowledge cell of the Revised Taxonomy table. Apply requires students to carry out or use a procedure in a given situation. Factual knowledge is a knowledge of terminology, specific details and elements. Students should use a calendar to identify dates, days of the week, and months of the year. The learning progression to **use** requires students to recognize the days in a week and months in a year, and execute specific information to solve real-world problems focused around the use of the calendar. Students should use a variety of forms of mathematical communication (K-1.6) to generalize connections (K-1.7) among the calendar, the environment, and other subjects. As students identify dates, days and months on the calendar, they explain and justify their answers (K-1.3) to their classmates and their teacher.

K-5.8 Recall equivalencies associated with time: 7 days = 1 week and 12 months = 1 year.

The objective of this indicator is recall, which is in the "remember factual" knowledge cell of the Revised Taxonomy table. Remember requires students to retrieve relevant knowledge from long-term memory. Factual knowledge is having the knowledge of specific details and elements. Students should recall equivalencies associated with time: 7 days = 1 week and 12 months = 1 year. The learning progression to **recall** requires students to identify the number of days in a week and months in a year, and recall another representation or name for them. Students should use multiple informal representations (K-1.8) such as calendars to support retention of these facts. They also use these informal representations to explain answers (K-1.3) to simple problems as they apply mathematical problem-solving strategies (K-1.1).

The following examples of possible assessment strategies may be modified as necessary to meet student/teacher needs. These examples are not derived from nor associated with any standardized testing.

At the end of the module, use this checklist to assess students' progress toward mastery of the indicators. **For the second 9 weeks, teachers should complete the section for Numbers 0-10**. There may be students who are ready to be assessed on all 4 sections.

For Numbers 0-5, the student is able to:		**For Numbers 11-20, the student is able to:**	
recall numbers forward and backward		recall numbers (forward only)	
Translate between numeral and quantity		Translate between numeral and quantity	
Compare sets of no more than 5 objects		Compare sets of no more than 20 objects	
Identify ordinal numbers through 5th		Identify ordinal numbers through 20th	
For Numbers 6-10, the student is able to:		**For Numbers 21-99, the student is able to:**	
recall numbers forward and backward		recall numbers (forward only)	
Translate between numeral and quantity		Translate between numeral and quantity (through 31)	
Compare sets of no more than 10 objects		Compare sets of no more than 31 objects	
Identify ordinal numbers through 10th		Identify ordinal numbers through 31th	

Calendar Checklist

Use the checklist below to assess a student's understanding of the organization of a calendar and ability to use a calendar to locate information. Insert notes or a rating in each of the 9 weeks columns to indicate progress towards mastery.

TASK	1st 9 Weeks	2nd 9 Weeks	3rd 9 Weeks	4th 9 Weeks
Names Days of Week in Order				
Correctly uses the vocabulary: "Today is ____, Yesterday was _____, Tomorrow will be _____."				
Names Months of Year in Order				
Identifies a week on a calendar				
Uses a calendar to locate a date				
Finds the name of the month on a calendar				
Answers questions about the monthly calendar: **How many Fridays?** **How many days during the month?** **What day is (*name a date)?*** **What is the date for the third Monday?**				

MODULE

2-2

Patterns, Relationships, and Functions

This module addresses the following indicators:

K-3.1 Identify simple growing patterns. (B1)
K-3.2 Analyze simple repeating and growing relationships to extend patterns. (B4)
K-3.3 Translate simple repeating and growing patterns into rules. (B2)
K-3.4 Classify objects according to one or more attributes such as color, size, shape, and thickness. (B2)

This module contains 6 lessons. 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 student's prior knowledge and/or skills related to this standard. It is recommended that students are preassessed on this prior knowledge.

Continuum of Knowledge

K-3.1 Identify simple growing patterns. (B1)

- Pre-Kindergarten students compared objects as they notice likenesses and differences, regardless of their preschool experiences. They look at how objects are grouped based upon their attributes (color, shape, size).
- In First grade, students will analyze (1-3.1) and translate (1-3.2) patterns in addition and subtraction

K-3.2 Analyze simple repeating and growing relationships to extend patterns. (B4)

- Pre-Kindergarten students have an awareness of how objects are different and the same. They notice if one cookie is bigger than another or if another child has the same color crayon or perhaps a different one than them.
- In First grade, students will translate patterns in addition and subtraction. (1-3.2)

K-3.3 Translate simple repeating and growing patterns into rules. (B2)

- Pre-Kindergarten students can recall patterns in musical sounds and clapping to its beat. They notice differences and similarities, which come naturally; therefore, classifying them into groups based on these similarities and differences is very natural as well.
- In First grade, students will classify a number as odd or even(1-3.5), analyze numeric relationships to complete and extend simple patterns(1-3.4), and classify change over time. (1-3.6)

K-3.4 Classify objects according to one or more attributes such as color, size, shape, and thickness. (B2)

- Pre-kindergarten students sort and classify two-dimensional shapes according to a single attribute (color, shape, size). Regardless of their pre-school experiences young children compare objects as they notice likeness and differences on a daily basis. They notice if one cookie is bigger than another or if another child has the same color crayon or perhaps a different one that they want. Noticing differences and similarities comes very naturally so classifying them into groups based on these similarities and differences is very natural as well. This skill must precede any of the skills related to patterns because they must be able to first identify like attributes.

- In First grade, students analyze numeric relationships to complete and extend simple patterns(1-3.4), and classify change over time as quantitative or qualitative. (1-3.6)

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.*

Attributes	Sort*	Pattern*
Repeating pattern	Growing pattern	Extend
Classify	Translate	Rule
Alike*	Different*	

II. Teaching the Lessons

1. Teaching Lesson A: Sorting by One Attribute

Teacher Notes

Pre-kindergarten students sort and classify two-dimensional shapes according to a single attribute (color, shape, size). Regardless of their pre-school experiences young children compare objects as they notice likeness and differences on a daily basis. They notice if one cookie is bigger than another or if another child has the same color crayon or perhaps a different one that they want. Noticing differences and similarities comes very naturally so classifying them into groups based on these similarities and differences is very natural as well. This skill must precede any of the skills related to patterns because they must be able to first identify like attributes.

a. Indicators with Taxonomy

K-3.4 Classify objects according to one or more attributes such as color, size, shape, and thickness.→ B2

Cognitive Process Dimension: Understand
Knowledge Dimension: Conceptual Knowledge

For this indicator, it is **essential** for students to:
- Identify the relationships and classify objects according to one or more attributes.
- Recognize how objects are alike and different.

For this indicator, it is **not essential** for students to:
- Sort and classify simultaneously, using more than one attribute (i.e. attributes with different, shapes, colors and facial expressions – all blue triangles with smiling faces and all blue triangles with sad faces).

b. Introductory Lesson

(Adapted from Hands-On Standards Pre K – K, Learning Resources, 2006, Pages 80-81.)

Materials Needed

- Attribute blocks (3 small and 3 large of each of the following shapes in yellow, read and blue: circle, square and triangle)
- Sorting circles (in yellow, red, and blue)

Suggested Literature Connection

Let's Sort, It's a Real Sport! By Tracy Kompelien focuses on sorting using different attributes.

*Sor**ting** by Henry Pluckrose. A Math Counts book*

Introductory Lesson A: Sorting by One Attribute

For this activity, you will need to create several small groups of no more than 3 children – pairs of children will work as well. Give each group of children a set of attribute blocks (see above) and a set of sorting circles.

Tell the children when they are sorting, they are put things into groups with other things that are the same. Be sure to look for misunderstandings and areas to address as well as children who are ready to move to the next step when observing the children sorting. It may be beneficial to have a larger set of materials all the children can observe.

For the first sort, have the children sort the blocks by color into the matching sorting circle. Check to see that the blocks were sorted correctly by all groups. Then clear the circles and return all the blocks to a pile.

Next, have the children sort the blocks by size. Be sure to tell the children they will only use 2 sorting circles for this sort; one for large shape and one for small shapes. Check to see that the blocks were sorted correctly by all groups. Then clear the circles and return all the blocks to a pile.

Lastly, have the children sort the blocks by shape. You will need to designate a shape for each color sorting circle, for instance circles in the red, squares in the blue and triangles in the yellow. Check to see that the blocks were sorted correctly by all groups. Then clear the circles and return all the blocks to a pile.

Collect the materials and review the activity with the children. You may ask the following questions: What does it mean to sort? How many groups did you make when you sorted by size? How many different groups did you make when you sorted by color? What if you have the

squares, triangles, circles and rectangles (hold up the shapes), how many groups would you need to sort them by shape?

When asking questions, listen for misunderstandings you may need to address and listen for which children need additional practice sorting by one attribute and which ones are ready for enrichment activities.

c. *Misconceptions/Common Errors*

- When preparing this activity, make sure all the attribute blocks for a group are the same thickness to avoid confusion. This adds another attribute that may confuse some children.
- Children may also be confused by attributes they are not sorting by in each step. For example, when sorting by shape, children become confused or focus on the color of the blocks. Remind these children to focus on only one attribute. These children will need more practice with sorting by one attribute.

d. *Additional Instructional Strategies/Differentiation*

- Use of attribute materials can lend itself to being sorted and classified in numerous ways. In addition to pattern blocks, other attribute materials can include: seashells, leaves, children shoes, pine cones, plastic bottle tops, and children themselves.
- Activities are best done with young children sitting on the floor in a large circle where all can see and have easy access to the materials.
- Students should recognize attributes through their conversations, "Let's put the blocks in the *large* box."

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.

http://pbskids.org/clifford/games/measuring_up.html
Clifford asks the player to find the object with the attribute he describes (thickest, longest, smallest, etc)

http://illuminations.nctm.org/LessonDetail.aspx?ID=L754
Illuminations lesson on sorting by attributes and graphing

f. Assessing the Lesson

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

As students are sorting their attribute blocks, observe whether students are able to sort all the blocks based on one attribute (i.e. size). Questions you may ask to assess their level of understanding for sorting or classifying shapes include:
Why do the blocks in this group belong together?
Can you explain how you sorted your blocks?

To assess whether students understand the different attributes a shape may have, describe a shape in their collection and ask students to find it. For example, say: *Find a large yellow circle. Find a small, blue, thin triangle*.

2. Teaching Lesson B: Repeating Patterns

Teacher Notes

After students are able to sort and classify based on attributes it is appropriate to introduce patterns. Patterns are related arrangements of objects, numbers, shapes, sounds, or movements. Teachers should use a variety of activities to help young children begin to visualize simple patterns, make predictions about them, and learn that a pattern can be extended.

Many opportunities to recognize and identify patterns will happen spontaneously during center time, circle time, snack time, and recess. It is especially important to recognize that children will learn best when teaching through the different modalities (visual, auditory, kinesthetic, and tactile). Music helps students recognize patterns. Clapping and singing in a repeating or growing pattern is an interactive way to get students involved as it involves sight, sound and movement.

a. Indicators with Taxonomy

K-3.2 Analyze simple repeating and growing relationships to extend patterns.→ B4

Cognitive Process Dimension: Analyze
Knowledge Dimension: Conceptual Knowledge

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

- Recognize the order of the pattern (i.e. 2 blue cubes, 3 red cubes is a simple repeating pattern, and 1 blue cube, 2 blue cubes, and 3 blue cubes would be a growing pattern).
- Organize the objects to continue the pattern.

- Recall the next number in the pattern (i.e. 6 comes after 5, 8 comes after 7, and counting by two's the 8 comes after the 6 are growing patterns. One clap, two claps, three claps are also examples of growing patterns.)
- Identify patterns in problems (i.e. 1 student has 2 hands, 2 students have 4 hands, How many hands would there be for 3 students?).
- Distinguish between a growing pattern and a repeating pattern.
- Understand simple two and three part patterns before introducing growing patterns.

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

- Recognize large number repeating patterns. It is important to have very simple growing patterns (i.e. students lined up to form a triangle, one student in the first row, two students in the second row, etc.).

b. Introductory Lesson

This lesson contains repeating patterns only. Growing patterns will be addressed in lesson 4 of this module.

(Adapted from Hands-On Standards PreK – K, Learning Resources, 2006, Pages 86-87.)

Materials Needed

- Snap or linking cubes (10 red and 10 blue per pair)

Suggested Literature Connection

Lots and Lots of Zebra Stripes by Stephen R Swinburne. A photo-essay of patterns that appear in nature.

Patterns (Math Counts series) helps children see examples of patterns with common objects.

Introductory Lesson B: Repeating Patterns

As a whole group, tell the children that a pattern is a set of things that repeats in order. Patterns can be made with sounds, movements or objects. Share a rhythmic pattern with the children such as *clap, clap, slap (legs), clap, clap, slap (legs)*. Then have them do the pattern with you for 30-60 seconds. Tell the children that patterns can also be made with colors. A color pattern is a set of colors that repeat in a specific order.

Share the following problem with the children. *Mr. Matthews is making a path of colored construction paper leading from the inside of the classroom to the playground. He wants the path to make a color pattern. He has started the pattern in this order: red, blue, red, blue, red. What color should go next?*

The children should work with a partner to solve the problem using the cubes to create a pattern train. Give each pair of children, 10 blue and 10 red snap cubes. Have the children make a pattern train of cubes in the order: red, blue, red, blue, red (like the story problem). Say to the children that you (the teacher) guess the next cube in the pattern is red. Tell the children to add a red cube to their train and examine the train. Ask if they think your guess was correct? Some children may not recognize that the red cube does not belong at the end of the train. Tell the children that your (the teacher's) first guess was not correct and have all the children remove the red cube from the end. Ask what cube they think you should try next? Have the children place the blue cube at the end of the pattern train. Ask if the blue cube belongs at the end of the train? Have the children say the pattern orally to reinforce the idea that the blue cube is the correct one. Have the children orally explain the repeating pattern (i.e.1red and 1 blue).

Discuss the activity with the children. Have the children share orally what a pattern is. Ask the children to explain how they know when they have a pattern. Show the children the same pattern train and ask the children what color cube should come next? Do this activity 1 or 2 more times depending on the needs of your children.

c. Misconceptions/Common Errors

Some children may have trouble determining the pattern in the activity. They may also not understand how to extend the pattern even after completing the activity above. You will need to work with these children by breaking the train apart by the core pattern (red, blue) while explaining the number and color of cubes you are removing. The cadence of your voice can help to establish the rhythm of the pattern.

d. Additional Instructional Strategies/Differentiation

Math and Literature activity: (*This activity provides differentiation for students who have an interest in art*.) Read *The Rainbow Fish*. Discuss the illustration of the rainbow fish in the story. Tell the students that today they will make their own rainbow fish using patterns. The teacher will review with the students what a pattern is and what it might look like with two or three colors. For example, red-yellow-white, red-yellow-white. This should help

students think about what type of pattern they could use. The students will color their fish using a pattern of their choice. [Anderson 5]

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.

http://nlvm.usu.edu/en/nav/frames_asid_184_g_1_t_1.html?from=category_g_1_t_1.html
Interactive site that lets students extend repeating patterns

f. Assessing the Lesson

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

Use the following questions that are embedded within the lesson to assess a student's ability to create and extend repeating patterns:
What is a pattern?
How do you know when you have a pattern that repeats?
Why do you think that cube goes next in your train?

3. Teaching Lesson C: Translate Repeating Patterns

Teacher Notes

After students are able to sort and classify based on attributes it is appropriate to introduce patterns. Patterns are related arrangements of objects, numbers, shapes, sounds, or movements. Teachers should use a variety of activities to help young children begin to visualize simple patterns, make predictions about them, and learn that a pattern can be extended.

With regard to analyzing patterns, a child may be able to predict that the blue square comes next in a repeating pattern but cannot say why. Later in the year he or she should be able to explain that "it is an AB pattern and because there is a red square at the end of the line, I know to put the blue one next. The A's are the red squares and the B's are the blue squares."

a. Indicators with Taxonomy

K-3.3 Translate simple repeating and growing patterns into rules. → B2

Cognitive Process Dimension: Understand
Knowledge Dimension: Conceptual Knowledge

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

- Recognize a repeating and growing pattern.
- Classify based on attributes.
- Identify and describe the pattern.
- Create ways to show the pattern another way (i.e. ABB or red, yellow, yellow pattern).

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

- Recognize patterns with more than 3 attributes (i.e. ABBCDDDE or red, blue, blue, yellow, orange, orange, orange, orange, green).

b. Introductory Lesson

This lesson contains repeating patterns only. Growing patterns will be addressed in lesson F of this module.

(Adapted from Hands-On Standards PreK – K, Learning Resources, 2006, Pages 92-93.)

Materials Needed

- Color tiles
- Pattern blocks

Suggested Literature Connection

The Noisy Farm by Stuart J. Murphy may be used to identify the sounds for each animal or object and focus on sounds that are repetitive, for example, "pong, pong, poink" for the sound of the bucket.

The Button Box by Margarette S. Reid is wonderful for sorting and classifying and can be used an introduction to children actually sorting buttons according to their attributes.

Introductory Lesson C: Translate Repeating Patterns

(The technology link for this lesson has pattern blocks that can be used to model the examples in this lesson.)

To introduce this skill, work with the children in whole or small groups. However the children may practice the skill in pairs or individually at centers.

Have the children make a red, yellow, red, yellow, red, yellow pattern using color tiles. Ask the children to describe the pattern by color and number such as one red tile, one yellow tile. Then ask the children to describe the pattern without using color words. If no one shares using AB, then teach this method to the students.

Ask the children to use red trapezoids and yellow hexagons pattern blocks to make a pattern that follows this same AB rule. You may need to instruct the children to use red trapezoids for the red tiles and yellow hexagons for the yellow tiles. Say the pattern orally "one red trapezoid, one yellow hexagon" and then say the pattern as "AB, AB". Explain to the children that this pattern follows the same AB rule but uses different materials.

Next have the children use blue and green pattern blocks to make a pattern that follows the same AB rule. The children can work in pairs to make and translate AB patters using the tiles and blocks. Be sure to ask the children to describe their patterns. Also remind the children that while you are using different materials you are again making the same AB pattern.

c. Misconceptions/Common Errors

Children need exposure to patterns other than the AB color pattern in this activity. Remind children that patterns can include a variety of colors and may have more than one of the same color in a row. Be sure to share examples of several patterns and give the children opportunities to work with the different patterns.

Students may have trouble recognizing patterns that only use one shape or only one color (i.e. triangle up, triangle down, triangle down).

d. Additional Instructional Strategies/Differentiation

- Create patterns by clapping your hands and stomping your feet, using AB, ABB, AAB patterns.
- Patterns can be made of motions, sounds, colors, or objects.
- Creative dance is a movement pattern that students can recognize repeating and growing patterns.
- Remind students to identify how the objects are different and focus on that attribute to help them find repetition in the pattern.

- Read I See Patterns by Linda Benton. Ask students to help you find patterns in the room or on their clothes. Have students determine the rule for the pattern in the text and the patterns found in the room. [Anderson 5]

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 understan*ding.

http://nlvm.usu.edu/en/nav/frames_asid_169_g_1_t_2.html?open=activities&from=category_g_1_t_2.html
Interactive pattern block page the teacher can use to create patterns or use with Lesson C.

f. Assessing the Lesson

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

As children create repeating patterns with their manipulatives, ask questions to assess their ability to explain the rule for their pattern.
Possible questions:
Which will be the next object in your pattern? Can you tell me how you know that?
Can you make a different repeating pattern using these same colors?
How is this pattern different from the first one?

4. Teaching Lesson D Growing Patterns

Teacher Notes:
The algebraic emphasis in kindergarten is on relationships. That is, how might objects be grouped by attributes or how might they be related resulting in a pattern. Therefore, kindergarten students should look for relationships and classify objects according to one or more attribute. They should progress to identifying simple growing patterns. By analyzing the relationship among the pattern parts, kindergarten students should extend simple repeating and growing patterns and translate patterns into rules.

The elements of growing patterns are related by increase or decrease whereas the elements of a simple repeating pattern are not affected by size/quantity. Simple repeating patterns have a specific attribute that changes. An example of a simple repeating pattern is red, blue, red, blue, red, blue, red, _____. An example of a growing pattern would be one clap, two claps, three claps, _____. These skills lay the foundation for the study of numeric patterns in first grade.

a. Indicators with Taxonomy

K-3.1 Identify simple growing patterns.→ B1
Cognitive Process Dimension: Remember
Knowledge Dimension: Conceptual Knowledge

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

- Recognize patterns in a variety of activities. For example, students may use objects, numbers, shapes, sounds or movements
- Identify the relationships and classify objects
- Recall the previous object or attribute
- Identify the relationship order

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

- Recognize large number repeating patterns. It is important to have very simple growing patterns.

b. Introductory Lesson

Materials Needed
Colored unifix cubes

Introductory Lesson D: Growing Patterns

In a whole group, review what your children know about patterns. Tell them that today you will be introducing a new kind of pattern, a pattern that will grow and repeat.

Begin by having the children copy a growing pattern that you create with a series of claps and stomps. A sample growing pattern may be:
Clap-stomp; clap-stomp-stomp; clap-stomp-stomp-stomp;
Clap-stomp-stomp-stomp-stomp
See if the students can tell how this pattern is different from the repeating patterns they have been working with.

Next have the students use colored unifix cubes to create some growing patterns by telling the following story.

> *Miss Spider likes to plant the flowers in her garden so they make a pattern. The first row of her garden has one yellow flower. The second row has one yellow flower and one red flower. The third row has one yellow flower and two red flowers. The fourth row has one yellow flower and three red flowers.*

Ask students to describe how the rows in the garden are changing. Explain that this is a growing pattern because each row has one more red flower than the row before it.

Have the students count the number of cubes for each row. Write the numbers on the board or a chart.

Row 1= 1
Row 2 = 2
Row 3= 3
Row 4 = 4

What is happening to the number of cubes in each row?
How many flowers will be in the 5th row? Ask students to use their cubes to show what the 5th row in the garden will look like. How many yellow flowers will there be? How many red flowers?

c. Misconceptions/Common Errors

Children often don't understand the growing aspect of the pattern. Often they will make a repeating pattern instead of growing. Students may miscount or continue using a repeating number instead of the next consecutive number

d. Additional Instructional Strategies/Differentiation

- Examples of growing patterns can be visualized through the use of connecting cubes. Discuss the number of cubes it would take for the next number in the pattern if it continues to grow by one cube.
- When introducing growing patterns, start with small numbers, such as 1 through 5.

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 questioning and observation. However, other formative assessment strategies should also be used.

In a small group, show students a repeating pattern and a growing pattern using color tiles or counters.
Repeating Pattern = red, yellow, red, yellow, …

Growing pattern = red, yellow; red, red, yellow; red, red, red, yellow…
Ask the students to tell ways the patterns are different?
Which pattern shows a growing pattern? How do you know the pattern is growing?

5. Teaching Lesson E: Extending Growing Patterns

Teacher Notes

With regard to analyzing patterns, a child may be able to predict that the blue square comes next in a repeating pattern but cannot say why. Later in the year he or she should be able to explain that "it is an AB pattern and because there is a red square at the end of the line, I know to put the blue one next. The A's are the red squares and the B's are the blue squares." Growing patterns tend to be more difficult for many students so generally it is best to introduce this after students have a good foundation for simple two and three part patterns. There will be students, nevertheless, who discover this on their own. They will notice that growing patterns simply increase (or decrease) by a predictable quantity – for example, students lined up to form a triangle, one student in the first row, two students in the second row, etc.

a. Indicators with Taxonomy

K-3.2 Analyze simple repeating and growing relationships to extend patterns.→ B4
Cognitive Process Dimension: Analyze
Knowledge Dimension: Conceptual Knowledge

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

- Recognize the order of the pattern (i.e. 2 blue cubes, 3 red cubes is a simple repeating pattern, and 1 blue cube, 2 blue cubes, and 3 blue cubes would be a growing pattern).
- Organize the objects to continue the pattern.
- Recall the next number in the pattern (i.e. 6 comes after 5, 8 comes after 7, and counting by two's the 8 comes after the 6 are growing patterns. One clap, two claps, three claps are also examples of growing patterns.)
- Identify patterns in problems (i.e. 1 student has 2 hands, 2 students have 4 hands, How many hands would there be for 3 students?).
- Distinguish between a growing pattern and a repeating pattern.
- Understand simple two and three part patterns before introducing growing patterns.

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

- Recognize large number repeating patterns. It is important to have very simple growing patterns (i.e. students lined up to form a triangle, one student in the first row, two students in the second row, etc.).

b. Introductory Lesson

This lesson contains growing patterns only. Repeating patterns were addressed in lesson 2 of this module.

(Adapted from Hands-On Standards PreK – K, Learning Resources, 2006, Pages 90-91.)

Materials Needed
Pattern blocks (10 orange squares and 10 green triangles per pair)

Introductory Lesson E: Extending Growing Patterns
In whole group, ask the children to tell you what they know about growing patterns. Tell them that today, you are going to identify and extend a growing pattern.

Display a house made of one square and one triangle pattern block on top. Tell the children that you made a block house and have them use their blocks to make a house just like yours.

Keeping the first house intact, add another house made of two squares and two triangles. Have the children make this same pattern with their blocks. Explain to the children that the houses are getting bigger each time because this is a growing pattern.

Add another house made with three squares and three triangles. Have the children make this same pattern with their blocks. Have the children identify each part of the pattern and ask them to think about how the fourth house would look. Guide the children to the conclusion that the fourth house should be made of 4 squares and 4 triangles. Have the children construct the fourth house.

Review the activity by asking the children to tell you what a growing pattern is. Ask how did the house change each time? What blocks changed each time?

c. Misconceptions/Common Errors

Students may not be able to tell why the next number or objects appears in the sequence, even if they are capable of demonstrating the next pattern.

If children have trouble understanding how the pattern is growing, have them compare the first house to the second house (or the second house to the third house) and discuss what is different or what changes each time.

d. Additional Instructional Strategies/Differentiation

Examples of growing patterns can be visualized through the use of connecting cubes. Discuss the number of cubes it would take for the next number in the pattern if it continues to grow by one cube.

Simple repeating and growing patterns consist of a series of related elements- each new element related to the previous in some manner.

Tools: pattern blocks, cubes, pasta, crayons, plastic colored bears, tangrams, children's shoes, people, etc…

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 questioning and observation. However, other formative assessment strategies should also be used.

As students extend growing patterns, observe whether they understand the pattern is growing and not repeating.
Questions that may be asked:
How is the second house different from the third house?
How many squares will you need for the fifth house? How many triangles?

6. Teaching Lesson F: Translate Growing Patterns

Teacher Notes

Many opportunities to recognize and identify patterns will happen spontaneously during center time, circle time, snack time, and recess. It is especially important to recognize that children will learn best when teaching through the different modalities (visual, auditory, kinesthetic, and tactile).

Music helps students recognize patterns. Clapping and singing in a repeating or growing pattern is an interactive way to get students involved as it involves sight, sound and movement. It is important for students to be able to recognize what is and what is not a pattern and to recognize simple growing patterns. Students must be comfortable with building patterns and talking about extending them before they begin to analyze how simple repeating and growing patterns evolve.

a. Indicators with Taxonomy

K-3.3 Translate simple repeating and growing patterns into rules. → B2
Cognitive Process Dimension: Understand
Knowledge Dimension: Conceptual Knowledge

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

- Recognize a repeating and growing pattern.
- Classify based on attributes.
- Identify and describe the pattern.
- Create ways to show the pattern another way (i.e. ABB or red, yellow, yellow pattern).

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

- Recognize patterns with more than 3 attributes (i.e. ABBCDDDE or red, blue, blue, yellow, orange, orange, orange, orange, green).

b. Introductory Lesson

This lesson contains translating growing patterns only. Translating repeating patterns were addressed in lesson C of this module.

(Adapted from Hands-On Standards PreK – K, Learning Resources, 2006, Pages 92-93.)

Materials Needed
Color tiles (same color) or Pattern block squares or cubes

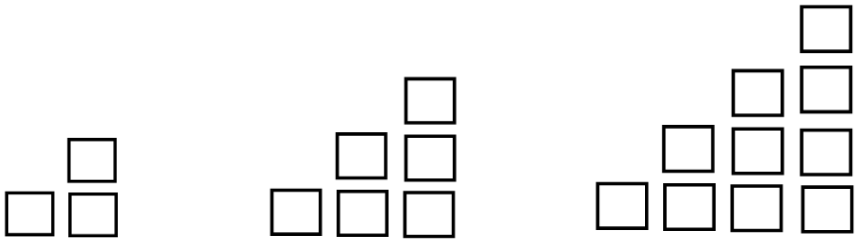
Introductory Lesson F: Translate Growing Patterns

To introduce this skill, work with the children in whole group or small groups. However the children may practice the skill in pairs or individually in centers.

Have the children make a growing pattern with the color tiles by placing one tile, then 2 tiles stacked right beside the first tile (step 1). Continue with the next step by repeating the step 1 and adding a column of 3 tiles

(step 2). Step 3 will have step 2 repeated and a column of 4 tiles added (step 3). Ask the children to describe the pattern by color and number. Then ask the children to describe the pattern without using color or number words. If no one shares using letters, then teach this method to the students. The pattern would be A, AB, ABC.

Ask the children to work with a partner to create a growing pattern using materials provided. Have each group of children share their growing pattern, tell how their pattern changes, and describe it without using color or number words (i.e. using A, AB)



Step 1 Step 2 Step 3

c. Misconceptions/Common Errors

Some children will not be able to identify growing patterns and therefore have difficulty translating the growing pattern.

Students may have trouble recognizing patterns that only use one shape or only one color (i.e. triangle up, triangle down, triangle down).

d. Additional Instructional Strategies/Differentiation

- Create patterns by clapping your hands and stomping your feet, using AB, ABB, AAB patterns.
- Patterns can be made of motions, sounds, colors, or objects.
- Creative dance is a movement pattern that students can recognize repeating and growing patterns.
- Remind students to identify how the objects are different and focus on that attribute to help them find repetition in the pattern.

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 questioning and observation. However, other formative assessment strategies should also be used.

Question students to assess their ability to describe the rule for the growing pattern. Some questions teachers may ask include:
How do you know this is a growing pattern?
How many cubes will be in the next shape? How do you know?
What would be another way you could describe this pattern without saying the names or colors of the shapes?

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.

Assessment Guidelines

K-3.1 Identify simple growing patterns.

The objective of this indicator is identify, which is in the "remember conceptual" knowledge cell of the Revised Taxonomy table. Identify requires students to retrieve relevant knowledge from long-term memory. Conceptual knowledge is having the knowledge to classify and categorize basic elements in a given structure. Students should identify simple growing patterns. The learning progression to **identify** requires students to recall basic counting numbers and recognize the differences in the pattern (i.e. numbers are getting larger with each addition to the pattern). Students should use a variety of forms of mathematical communication (K-1.6) such as manipulatives, words or movement to convey the pattern. They should use these processes to identify the simple growing patterns and extend the pattern. As students make predictions, they should exchange these ideas (K-1.2) with classmates and explain their answers to simple problems (K-1.3). Students should indentify simple growing patterns that they have seen before.

K-3.2 Analyze simple repeating and growing relationships to extend patterns.

The objective of this indicator is analyze, which is in the "analyze conceptual" knowledge cell of the Revised Taxonomy table. Analyze requires students to determine how the parts relate to one another. Conceptual knowledge is having the knowledge to classify and categorize basic elements in a given structure. Students should analyze simple repeating and growing relationships to extend patterns. The

learning progression to **analyze** requires students to recall basic counting numbers and recognize the differences in the pattern (i.e. patterns have a specific attribute that changes or increases). Students should use a variety of forms of mathematical communication (K-1.6) such as visuals, kinesthetic, auditory, and tactile models to convey the pattern. They should use these processes to analyze the simple repeating and growing patterns and predict what would come next in the sequence. As students make predictions, they should generate conjectures (K-1.2) with classmates and apply mathematical problem solving strategies to extend patterns. (K-1.1). Students should analyze simple repeating and growing relationships of patterns.

K-3.3 Translate simple repeating and growing patterns into rules.

The objective of this indicator is translate, which is in the "understand conceptual" knowledge cell of the Revised Taxonomy table. Understand requires students to construct meaning from instructional messages. Conceptual knowledge is having the knowledge of theories, models, and structures. Students should translate simple repeating and growing patterns into rules. The learning progression to **translate** requires students to understand the basic elements and recognize the similarities and differences that makes up the pattern. Students should visualize and analyze patterns (K-1.4) in a variety of activities to generate conjectures (K-1.2) that will justify (K-1.3) their answers to simple problems. As students make predictions, they should apply (K-1.1) mathematical problem solving strategies to determine the rules for the repeating or growing pattern. Students should translate simple repeating and growing patterns into rules.

K-3.4 Classify objects according to one or more attributes such as color, size, shape, and thickness.

The objective of this indicator is classify, which is in the "understand conceptual" knowledge cell of the Revised Taxonomy table. Understand requires students to construct meaning from instructional messages, including oral, written, and graphic. Conceptual knowledge is having the knowledge of classifications and categories. Students should classify objects according to one or more attributes such as color, size, shape, and thickness. The learning progression to **classify** requires students to recognize that something belongs in a certain category. Students should visualize and analyze patterns (K-1.4) in a variety of activities to exchange mathematical ideas, (K-1.2) using a variety of forms of communication (K-1.6) that will justify (K-1.3) their answers to simple problems. Students should classify objects according to one or more attributes such as color, size, shape, and thickness.

The following examples of possible assessment strategies may be modified as necessary to meet student/teacher needs. These examples are not derived from nor associated with any standardized testing.

Performance Task	**Observation Checklist**
1A. Have children sort a collection of attribute blocks according to an attribute that you name (color, size, shape, thickness). 1B. Ask student to sort the blocks a different way. **If attribute blocks are not available use another collection of materials (i.e buttons)	_____ Sorts materials when given a sorting method by the teacher _____ Able to sort a collection of materials by a single attribute _____ Explains sorting method _____ Sorts a collection of materials but does not stay focused on one attribute (ex: a red group, a large group, a triangle group) NOTES:
2. Have students create and extend a repeating pattern with the Attribute blocks or a set of Pattern Blocks Explain the pattern. Extend the pattern one complete sequence Create your own repeating pattern.	_____ Explains the pattern _____ Extends the repeating pattern one complete sequence (Example: ABB ABB ABB ABB _____ *the student extends for the ABB sequence)* _____ Extends the pattern but only one piece of the sequence (Ex: In the pattern named above, student only extends for the first A of the ABB) _____ Does not see the repeating pattern _____ Creates their own repeating pattern with the blocks NOTES:
3. Show students a growing pattern that has been created using with counters or color tiles. Explain the pattern. What is the next part of this pattern?	_____ Explains the pattern _____Extends the growing pattern one complete sequence (Example: AB AAB AAAB _____ T*he student's response is AAAAB)* _____ Extends pattern but only one piece of the sequence _____ Does not understand growing patterns. NOTES:

MODULE

2-3

Time to the Hour

This module addresses the following indicator(s):

K-5.6 Use analog and digital clocks to tell time to the hour. (C3)

This module contains 1 lesson. This lesson is **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 student's prior knowledge and/or skills related to this standard. It is recommended that students are pre-assessed on this prior knowledge.

Continuum of Knowledge

K-5.6 Use analog and digital clocks to tell time to the hour.

- Pre-Kindergarten students have experienced timing events with informal units as they observe water dripping from a faucet, swing going back and forth, jumping rope and listening to rain hitting a bucket outside, etc.
- In First grade, students use analog and digital clocks to tell and record time to the half hour. (1-5.8)

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
Clocks	Time
Hour*	o'clock*
Hour hand*	

II. Teaching the Lesson(s)

1. Teaching Lesson A Time to the Hour

Teacher Notes

Time is different than the other attributes commonly measured in school because it cannot be seen and it is more difficult for students to comprehend units of time and how they are matched against a given time period or duration.

The common instrument for measuring time is the clock. However, learning to tell time has little to do with time measurement and more to do with learning to read a dial type instrument.

Reading analog clocks can be confusing especially for children who do not have them in their homes. Children need many opportunities to get hands on experience with real clocks in order to master this life skill.

a. Indicators with Taxonomy

K-5.6 Use analog and digital clocks to tell time to the hour.→ C3

Cognitive Process Dimension: Apply
Knowledge Dimension: Procedural Knowledge

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

- Understand time duration (i.e., observe the duration of certain events and compare them in terms of long and short periods of time).
- Use analog and digital clocks to tell time to the hour.
- Read the time on a digital clock correctly.
- Distinguish between the hour and minute hands on an analogue clock
- Identify the scale on the clock before attempting to tell time.

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

- Tell time to the half hour or minute.
- Determine elapsed time (i.e., two hours ago, it was _____).

b. Introductory Lesson

(Adapted from Teaching Student-Centered Mathematics Grades K-3, by John A. Van de Walle and LouAnn H. Louvin, page 244)

Materials Needed

- Paper plate or clock face (one per child)
- Hour hand – construction paper or card stock (one per child)
- Brad fasteners (one per child)

Suggested Literature Connection:

All about an Hour by Joanne Randolph explains the units of time that make up an hour, looks at the hours that make up a day, and discusses how to understand a clock.

The Grouchy Ladybug by Eric Carle tells a delightful story of a ladybug's journey focusing on hours.

Introductory Lesson A: Time to the Hour

In advance, prepare clock faces with one hour hand for each student. Either use a paper plate and write the numerals 1-12 around the edge or glue a blank clock face pattern to a paper plate. Use a brass fastener to attach an hour hand (made from card stock) to the clock face.

Show the students a demonstration clock (SMART Notebook gallery, Judy Clock, etc). Discuss the difference between analog and digital clocks. Some children may only see analog clocks at school. Have students share how the hands on the clock are different. Have them watch the short hand as you

move the long hand around the clock. Which hand moves faster? How far did the short hand move? Explain that the short hand is called the hour hand and it tells the hour of the day or night.

Write a few digital o'clock times on a white board or chart. Model the times on your analog clock. Compare the analog time with the digital time. How are they the same? How are they different?

Ask the children: Do you think you can tell time with just a clock that has one hand? Give each child a pre-made clock with just an hour hand. Call out some approximate times for the children to show on their hour hand clocks. Examples:

It's about 7 o'clock.
It's a little past 9 o'clock.
It's halfway between 2:00 and 3:00.

Continue to give approximate times as well as o'clock times. Involve the children in generating times to make by asking questions about their daily routines such as bed time or diner time. If they give times such as 7:15, then restate them with approximate language such as "7:15 is a little after 7o'clock."

At the end of the lesson questions to review such as: What information does a clock give you? What hand did you move on the clock? What are some differences between analog and digital time? What is the same?

c. Misconceptions/Common Errors

Reading an analog clock is confusing because there are two hands moving at different rates and the numbers have multiple meanings (i.e. 1 o'clock (hour) or 5 minutes after an hour). For these reasons, children should work with only the hour hand until that skill is secure to reduce confusion when the minute hand is introduced in first grade.

Students may not read the numbers on the digital clock from left to right, although they are familiar with the numbers.

d. Additional Instructional Strategies/Differentiation

Keep the hour hand clocks where the children can access them to practice reading them often. For continued practice, point out o'clock times during your daily routines using the classroom clock. Children need many exposures to time as well as opportunities to practice in order to develop an understanding to telling time.

Because measurement is used extensively in the real world, teachers should design instruction in such a way that measurement (as well as conversations about measurement) is taught and practiced in real situations.

Use the vocabulary "long" and "short" to describe the hands on the clock (i.e., the long hand is the minute hand and the short hand is the hour hand).

To tell time to the hour, students need to understand that "that particular hour" occurs when the hour hand is on the numeral or between two numerals. For example, the "three-hour" is when the hour hand is on three or between three and four on the clock. Ask students to tell you in which hour are we now; are we in the "nine-hour" or the "ten-hour"? How do you know?

Enrichment: Children who understand how to tell time to the hour, may begin exploring times using both clock hands. Add the minute hand to their clocks. Begin by positioning the minute hand to coincide with the hour hand during o'clock times. If children are ready, they may begin telling time to the half hour which a first grade skill.

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 questioning and observation. However, other formative assessment strategies should also be used.

Questions that are embedded within the lesson for formative assessment information include:

What information does a clock give you? What hand did you move on the clock? What are some differences between analog and digital time? What is the same?

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.

Assessment Guidelines

K-5.6 Use analog and digital clocks to tell time to the hour.

The objective of this indicator is use, which is in the "apply procedural" knowledge cell of the Revised Taxonomy table. Apply requires students to carry out or use a procedure in a given situation. Students should use analog and digital clocks to tell time to the hour. The learning progression to **use** requires students to recall basic counting numbers, understand what the hands of the clock represent, and determine how to read the hands to the hour. Students use this information to explore multiple informal representations (K-1.8). They apply mathematical problem-solving strategies (K-1.1) to determine the time. To deepen understanding, students represent time on a clock when given the time. As they work, students exchange mathematical ideas with their classmates and teacher and explain and justify their answers (K-1.3)

The following examples of possible assessment strategies may be modified as necessary to meet student/teacher needs. These examples are not derived from nor associated with any standardized testing.

Checklist for Telling Time to the Hour	
Performance Task	**Notes**
Use a Teacher Demonstration Clock to display times for students to identify: 3:00 6:00 10:00	
Have the student set the hands on the clock to show times that are named: 5:00 9:00 1:00 **If students have difficulty using a clock with both hands, allow them to use their "Hour-hand clock"	

MODULE

2-4

Coin Identification and Value

This module addresses the following indicators:

K-5.1 Identify a penny, a nickel, a dime, a quarter, and a dollar and the value of each. (A1)

This module contains 1 lesson. This lesson is **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 student's prior knowledge and/or skills related to this standard. It is recommended that students are pre-assessed on this prior knowledge.

Continuum of Knowledge

K-5.1 Identify a penny, a nickel, a dime, a quarter, and a dollar and the value of each. (A1)

- Pre-Kindergarten students' prior experiences with money are wide and varied. Most students understand that the coins and paper money are used to purchase things. Some will be able to identify a few coins, and some can even tell what certain coins will buy (for example, a quarter will buy a toy from the small toy machine).
- In First grade, students use a counting procedure to determine the value of a collection of pennies, nickels, dimes, and quarters totaling less than a dollar. (I-5.1) Students represent a nickel, a dime, a quarter, a half-dollar, and a dollar in combinations of coins(1-5.2) and representing money by using the cent and dollar notations. (1-5.3)

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.*

Penny (one cent)*
dime (ten cents)*
dollar*
Value
nickel (five cents)*
Quarter (twenty-five cents)*
Coins*
Cents*

II. Teaching the Lesson

1. Teaching Lesson A- Identifying Coins and Values

Teacher Notes

Students will learn the names of coins and their corresponding values through repeated exposure throughout year. This is "social knowledge". It is important to know that students who can accurately match a coin to its value may not necessarily understand the concept of coin value. To truly understand coin value, students must first hold a firm understanding of the quantities 5, 10, and 25 and then be able to "see" these quantities within one single coin. "Nowhere else do we say, "this is five," when pointing to a single object.

Brief daily practice with identifying money (such as during opening/calendar time or during a transition) will help students to become proficient in the skill due to repeated exposure.

a. Indicators with Taxonomy

K-5.1 Identify a penny, a nickel, a dime, a quarter, and a dollar and the value of each. (A1)

Cognitive Process Dimension: Remember
Knowledge Dimension: Factual Knowledge

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

- Identify the similarities and differences in each coin.
- Recognize the number value for each coin.
- Sort the coins based on attributes.
- Name the coins.

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

- Determine the value of a collection of coins.
- Create different combinations of coins with the same value (i.e. 5 pennies + a nickel = a dime).

b. Introductory Lesson

Teacher Note

Mathematics learning builds over the course of time. This is especially true with concepts such as number sense; equivalencies; weight, linear, and liquid measurement; time; money, just to name a few. 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 this Module, 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.

Materials Needed:

- Real pennies, nickels, dimes, and quarters, and dollars (one for each child or small group of children)
- Hand lens (one for each child or small group of children)
- Chart paper and marker

Suggested Literature Connection :

Benny's Pennies by Pat Brisson can be used to introduce students to coins. The story involves a boy named Benny who has five pennies and goes shopping.

Introductory Lesson A: Identifying Coins and Values

Advanced preparation:

Prepare a piece of chart paper with the title "Penny" and print clipart of an enlarged penny, both heads and tails to tape or glue on. You might also adhere two real pennies on the chart, one facing heads and one facing tails. Make similar charts for the other coins and bills as you introduce them. If SMART Notebook is available, teachers may create a notebook lesson using the gallery to find pictures of the coins.

During the Lesson:

Provide each student with a penny and a hand lens. Tell the students that they are going to be using their senses to investigate the characteristics of a penny today. Allow time for students to study their penny using their senses and the hand lens. (If this is their first experience with a hand lens, you will want to discuss their purpose and how they work first.) Ask students what they notice about the penny. You may guide them to look at the smooth edge, the copper (reddish-brown) color, etc.). As students offer their observations, record them on a piece of chart paper labeled "Penny". You will also tell the students that the penny is worth 1¢ and chart that as well.

On subsequent days you will follow the same procedure in introducing the other coins, in order of value, one at a time. As you introduce a new coin, your discussion should expand to include questions about comparing that coin to the coins already introduced. Make sure to discuss the coin values as well.

c. Misconceptions/Common Errors

- Students at this age might hold the misconception that larger sized coins represent greater values and smaller coins represent lesser values.
- Students may have difficulty counting coins that have the same color (nickel, dime, quarter).
- Students may confuse the nickel and quarter due to their closeness in size and color

d. Additional Instructional Strategies/Differentiation

- Remediation: For students who hold the misconception that larger-sized coins represent greater values and vice versa, you may want to purchase weighted coins to use in a bucket balance with weights.
- Remediation: For students who are having difficulty identifying the different coins, let them make crayon rubbings of each side of the coins. Write the name of the coin below each coin.

- **Enrichment:** Have students who know their coins, work with a partner and make up riddles about the coins. Have them take turns creating riddles that describe the properties of the different coins. *"I'm thinking of a coin that is larger than a penny but smaller than a quarter."*

- Although money is a difficult concept for young students, it is important for them to have an understanding of money as it applies to the real world. Create a center with items for students to purchase using the values for each coin.
- For extra practice, make patterns with coins and have students recite them by their names and then their values. (penny, dime, nickel, penny, dime, nickel…then 1¢, 10¢, 5¢, 1¢, 10¢, 5¢)

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.

1)http://www.drjean.org/html/monthly_act/act_2008/03_Mar/1booksMar/moneySongStudent.pdf (The Money Song)

http://harcourtschool.com/activity/money_build_robot/
Interactive game. Students count how many of a particular coin are in the bag.

f. Assessing the Lesson

During the lesson ask students to identify the coin names and ask them to tell you the clues they used to figure it out. Then ask students to tell you the value or worth of the coin. You may extend by presenting them with two coins, asking them to identify the names and tell which one is worth the most or least.

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.

Assessment Guidelines
K-5.1 Identify a penny, a nickel, a dime, a quarter, and a dollar and the value of each.

The objective of this indicator is identify, which is in the "remember factual" knowledge cell of the Revised Taxonomy table. To remember requires students to retrieve relevant knowledge from long-term memory. Factual knowledge is having the knowledge of specific details and elements. Students should identify a penny, a nickel, a dime, a quarter, and a dollar and the value of each. The learning progression to **identify** requires students to explore and use multiple informal representations (K-1.8) of coins such as concrete and/or pictorial models and real coins. They recognize the differences in each coin based on size and classify objects according to one or more attributes such as color, size, shape, and thickness. Students analyze information from the teacher to understand that each coin has a different value. They use their understanding to identify coins and their values when given representations in a variety of forms (concrete, pictorial or real).

The following examples of possible assessment strategies may be modified as necessary to meet student/teacher needs. These examples are not derived from nor associated with any standardized testing.

Use a checklist where students might be shown coins and bills and asked for their names and values. As the year progresses and students are exposed to plastic models and paper pictorial models, it would be appropriate to add those models as additional summative assessment.

Student Name	**Knows the name of the coin**						**Knows the value of the coin**				
	Penny	Nickel	Dime	Quarter	Dollar		Penny	Nickel	Dime	Quarter	Dollar