

Planning Guide

Kindergarten *Subitizing*

Number
Specific Outcome 2

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Planning Guide: Kindergarten Subtizing

Strand: Number

Specific Outcome: 2

This *Planning Guide* addresses the following outcomes from the Program of Studies:

Strand: Number

Specific Outcome: 2. Subitize (recognize at a glance) and name familiar arrangements of 1 to 5 objects or dots.

Curriculum Focus

This sample focuses on:

- developing number sense.

What Is a Planning Guide?

Planning Guides are a tool for teachers to use in designing instruction and assessment that focuses on developing and deepening students' understanding of mathematical concepts. This tool is based on the process outlined in *Understanding by Design* by Grant Wiggins and Jay McTighe.

Planning Steps

The following steps will help you through the Planning Guide:

- **Step 1: Identify Outcomes to Address** (p. 3)
- **Step 2: Determine Evidence of Student Learning** (p. 4)
- **Step 3: Plan for Instruction** (p. 5)
- **Step 4: Assess Student Learning** (p. 10)
- **Step 5: Follow-up on Assessment** (p. 12)

Step 1: Identify Outcomes to Address

Guiding Questions

- What do I want my students to learn?
- What can my students currently understand and do?
- What do I want my students to understand and be able to do based on the Big Ideas and specific outcomes in the program of studies?

Big Ideas

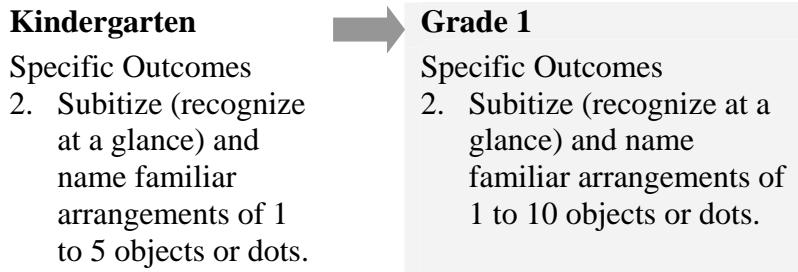
Number sense, which can be thought of as intuition about numbers, is the most important foundation of numeracy. (British Columbia Ministry of Education 2000)

A true sense of number goes well beyond the skills of simply counting, memorizing facts and the situational rote use of algorithms. Mastery of number facts is expected to be attained by students as they develop their number sense. It allows for facility with more complex computations but should not be attained at the expense of an understanding of number.

Number sense develops when students connect numbers to their own real-life experiences, and use benchmarks and referents. This results in students who are computationally fluent, flexible with numbers and have intuition about numbers. The evolving number sense typically comes as a by-product of learning rather than through direct instruction. However, number sense can be developed by providing rich mathematical tasks that allow students to make connections to their own experiences and their previous learning.

Sequence of Outcomes from the Program of Studies

See <http://education.alberta.ca/teachers/core/math/programs.aspx> for the complete program of studies.



Step 2: Determine Evidence of Student Learning

Guiding Questions

- What evidence will I look for to know that learning has occurred?
- What should students demonstrate to show their understanding of the mathematical concepts, skills and Big Ideas?

Using Achievement Indicators

As you begin planning lessons and learning activities, keep in mind ongoing ways to monitor and assess student learning. One starting point for this planning is to consider the achievement indicators listed in the *Mathematics Kindergarten to Grade 9 Program of Studies with Achievement Indicators*. You may also generate your own indicators and use them to guide your observation of the students.

The following achievement indicators may be used to determine whether students have met this specific outcome.

- Look briefly at a given familiar arrangement of 1 to 5 objects or dots and identify the number represented without counting.
- Identify the number represented by a given dot arrangement on a five frame.

Some sample behaviours to look for in relation to these indicators are suggested for many of the instructional activities in **Step 3, Section C, Choosing Learning Activities** (p. 7).

Step 3: Plan for Instruction

Guiding Questions

- What learning opportunities and experiences should I provide to promote learning of the outcomes and permit students to demonstrate their learning?
- What teaching strategies and resources should I use?
- How will I meet the diverse learning needs of my students?

A. Assessing Prior Knowledge and Skills

Before introducing new material, consider ways to assess and build on students' knowledge and skills related to number. For example:

- Ask students, "How many fingers am I holding up?" and check to see if they are counting or recognizing the number at a glance.
- If they are shown two sets of objects, can they tell you which set has the largest number of objects and/or which set has the smallest number of objects?
- Ask students how many coins are in a collection. If students correctly count and say "five," ask, "Are there five coins?" If a student hesitates and counts again, question whether or not the student has developed cardinality, which is the ability to know that the last count word is the number of items in the set. A student needs cardinality to subitize.
- There are nine boys in the class. Ask students, "How many pencils will I need so that each boy can have one?" If they answer "nine," you know that they have an understanding of one-to-one correspondence. This helps you determine whether or not they understand that number represents quantity.

If a student appears to have difficulty with these tasks, consider further individual assessment, such as a structured interview, to determine the student's level of skill and understanding. See **Sample Structured Interview: Assessing Prior Knowledge and Skills** (p. 6).

Sample Structured Interview: Assessing Prior Knowledge and Skills

Directions	Date:	
	Not Quite There	Ready to Apply
Ask students, "How many fingers am I holding up?" and check to see if they are counting or recognizing the number at a glance.	<ul style="list-style-type: none"> Does not recognize at a glance the number of fingers. 	<ul style="list-style-type: none"> Recognizes at a glance the correct number of fingers.
If students are shown two sets of objects, can they tell you which set has the largest number of objects and/or which set has the smallest number of objects?	<ul style="list-style-type: none"> Is not able to tell which set is larger or smaller. 	<ul style="list-style-type: none"> Is able to tell which set is larger or smaller.
Ask students how many coins are in a collection. If students correctly count and say "five," ask, "Are there five coins?" What answer do they give?	<ul style="list-style-type: none"> Hesitates and counts again. 	<ul style="list-style-type: none"> Does not hesitate in repeating the initial correct answer.
There are nine boys in the class. Ask students, "How many pencils will I need so that each boy can have one?"	<ul style="list-style-type: none"> Is unable to answer. Has to go back and count again. 	<ul style="list-style-type: none"> Answers "nine" without hesitation.

B. Choosing Instructional Strategies

Consider the following strategies when planning lessons.

- Wherever possible, the number activities should involve some physical materials.
- Students should communicate numbers in various ways.
- Provide opportunities for students to represent numbers in many different ways.
- Encourage students to display numbers whenever possible, either with manipulatives or by enacting the number physically; e.g., showing fingers, clapping.
- To motivate students, use familiar objects whenever possible.
- Expect students to explain, verbally, how they know how many are in a set.

C. Choosing Learning Activities

The following learning activities are examples of activities that could be used to develop student understanding of the concepts identified in Step 1.

Sample Activities:

1. Teaching Number Sense (p. 8)

Sample Activity 1: Teaching Number Sense

1. Pie Plate Numbers

On small paper pie plates, write a numeral for each student between one and five. Hand out several stickers to each student with one or two of the pie plates. Have the student place the corresponding number of stickers on each plate.

Gradually, over a few days, hand out pie plates with a numeral and corresponding number word, having students add the corresponding number of stickers. Eventually, have students add stickers to a blank pie plate and get them to write down the correct numeral and number word.

Look For ...

Do students:

- add the correct number of stickers to each pie plate?

2. Subitize

Place between one and five discs on the glass of the overhead projector and cover them. Have students look at the screen and uncover the discs for a few seconds only. Then ask students to tell you how many discs they saw. Repeat with different numbers and different arrangements for each number.

3. Physical Numbers

Take students outside and have them line up in a row facing you. Ask them to count while moving three steps forward then four steps backward and so on. Clap between one and five times and ask them how many times you clapped. Ask them to say the number sometimes and at other times ask them to repeat the number of claps. You can do the same things with stomping or jumping jacks.

4. Number Chairs

Put five chairs at the front of the room. Have five students line up in front of the chairs. As the whole class counts from one to five, students sit down one at a time. Then have the class count backward from five to one. As each number is counted, students stand up one at a time.

5. Roll the Die

In pairs, students roll a single die and after each turn at rolling the die, the student places the corresponding number of manipulatives (cubes) in a cup. Students take turns rolling the die. Each student tries to fill his or her own cup. At the end of the game, they can count the number of objects in the cup.

6. Five Frames

Using a five frame, have students identify the number of dots at a glance. Alternatively, have each student, or a pair of students, use a five frame. When you place a number on the board, have students place the corresponding number of counters in their five frames.

Look For ...

Do students:

- identify the number at a glance, without slowly counting what they see?

7. Spatial Arrangements

Provide students with paper plates and coloured dot stickers. Have them make different spatial arrangements for the numbers between one and five; e.g.,

Some examples for *four* might be:

O O

OOOO

O O

O
O
O
O

Step 4: Assess Student Learning

Guiding Questions

- Look back at what you determined as acceptable evidence in Step 2.
- What are the most appropriate methods and activities for assessing student learning?
- How will I align my assessment strategies with my teaching strategies?

Sample Assessment Tasks

In addition to ongoing assessment throughout the lessons, consider the following sample activities to evaluate students' learning at key milestones. Suggestions are given for assessing all students as a class or in groups, individual students in need of further evaluation, and individual or groups of students in a variety of contexts.

A. Whole Class/Group Assessment

Note: Performance-based assessment tasks are under development.

1. Show pie plate examples that you have prepared ahead with the wrong number of stickers. See if students can catch the mistake. Use large stickers when showing these to the whole group.
2. Hold up a card with an arrangement of dots between one and five and ask, "How many?" Have students write the corresponding numeral on a piece of paper and hold it up for you to see.
3. Using the five frames individually, ask students to show you a number you announce to the class. Walk around and see if they have the correct number of corresponding dots.
4. Give each student five cards with the numbers one to five on them. Uncover a series of dots on the overhead projector and have students hold up the number card with the correct corresponding numeral on it. This gives you a quick way of identifying who is able to subitize.

B. One-on-one Assessment

Assessment activities can be used with individual students, especially students who may be having difficulty with the outcome.

1. Tell the student, "A student was counting things in the class and he counted four. What could he have been counting?" Allow the student to move around the room showing you possible answers.
2. Have a student roll a die and then, with coloured discs, create a pattern with the corresponding number.

3. Using coloured discs, have a student show you three different patterns that represent a particular number between one and five.
4. Show the student two different five frames. Ask, "Which one has more?" and "How do you know?"

C. Applied Learning

Provide opportunities for students to use their number strategies in a practical situation and notice whether or not the strategies transfer. For example, ask, "When do we have five of something?" (e.g., five fingers, five toes). Have them draw an example. "When do we have two?" (e.g., two wheels on a bicycle, two hands). This could be done with the whole class, using a brainstorming approach. Do this for the numbers one to five.

Step 5: Follow-up on Assessment

Guiding Questions

- What conclusions can be made from assessment information?
- How effective have instructional approaches been?
- What are the next steps in instruction?

A. Addressing Gaps in Learning

If a student is having difficulty learning to subitize the numbers between one and five, start with the numbers one and two. Use concrete materials whenever possible. Have the student sort a series of dots into sets of one or two. Show the student different sets of two to see if they recognize them. Count sets of up to five objects. As you count sets, have them also identify the numerals and number words.

B. Reinforcing and Extending Learning

Students who have achieved or exceeded the outcomes, will benefit from ongoing opportunities to apply and extend their learning.

Consider strategies, such as the following.

- Subitize with numbers up to 10.
- Ask the student to show you five blocks, using manipulatives. Then ask him or her to show you three blocks and ask, "What did you have to do?"
- Ask the student, "If you had four plates and I put two cookies on each plate, how many cookies would be on the plates all together?"
- Provide tips for parents on practicing the identification or extension of subitizing numbers at home. Look for sets of up to five in their daily living; e.g., in the kitchen, on the wallpaper or in the bathroom (five toothbrushes). When they are driving in the car, they might count or identify sets of things.

Bibliography

Step 1 References

British Columbia Ministry of Education. *The Primary Program: A Framework for Teaching*. Victoria, BC: British Columbia Ministry of Education, 2000.

Step 2 References

Alberta Education. *The Alberta K–9 Mathematics Program of Studies with Achievement Indicators*. Edmonton, AB: Alberta Education, 2007.

Other References

Wiggins, Grant and Jay McTighe. *Understanding by Design*. Alexandria, VA: Association for Supervision and Curriculum Development, 1998.