

SD38 K-2 Numeracy Assessment Support Document

RICHMOND
SCHOOL DISTRICT NO.38

November 2019

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Overview

The following materials were developed in collaboration with the Learning Services Numeracy Assessment Committee from 2017-2019. From our work together, a SD38 K-2 Numeracy Assessment Tool was developed, drawing upon the BC Early Numeracy Project and current research regarding assessment of early numeracy. Thirty Richmond primary teachers piloted the assessment with their students in the fall of 2018 and their findings and feedback contributed to edits and revisions to the assessment tool. A further field test was done in the fall of 2019, again with thirty Richmond primary teachers using the assessment tool with their students.

As of November 2019, the assessment tool and recording sheets are approved to use in K-2 Richmond classrooms.

Further resources to support this assessment tool and related instruction will continue to be developed.

Literacy and Numeracy Assessment in the Early Years

“Literacy is the ability to understand, critically analyze, and create a variety of forms of communication, including oral, written, visual, digital, and multimedia, in order to accomplish one’s goals.

Numeracy is the ability to understand and apply mathematical concepts, processes, and skills to solve problems in a variety of contexts.

Literacy and numeracy are fundamental to all learning. While they are commonly associated with language learning and mathematics, literacy and numeracy are applied in all areas of learning.”

<https://curriculum.gov.bc.ca/curriculum/overview>

The purpose of this section of this document is to outline the purposes of and provide guidelines and recommendations for Level A assessments in Richmond for Literacy and Numeracy.

What is assessment?

Assessment is the systematic process of gathering information about individual students which may assist in understanding their needs and learning profile so that necessary planning for learning and services can be provided. It begins with the classroom teacher and may expand to include other individuals both within and beyond the school system. While both formal and informal assessment procedures may be useful, assessment should generally begin with observation of the student by the teacher or others in the classroom context. Assessment may then proceed to more formal or clinical measures and contexts in an incremental manner as required to design effective programs and supports for the student.

Levels of Assessment

Since assessment includes more than testing, it is important to keep the various types of assessment in mind. The first source of support for all students is the classroom teacher, who has already obtained information through observation, work samples, student and parent interviews, screening tests, etc.. These can be described as **Level A** assessments. When a teacher has questions about a particular student's needs or abilities, the teacher can turn to members of the **School Based Team (SBT)** for further advice, support and assistance. Actions from the School Based Team meeting may result in collecting additional data to supplement the information the teacher has already collected. This is where **Level B** or **Level C** assessment tools may be of assistance. **Level B** tests require specific training for administration, scoring and interpretation. These tests are more complex than Level A assessments and should only be administered by someone who is trained. **Level C** tests require advanced (graduate level) training for interpretation, and in the school setting, are generally administered by the school psychologist. Level A and B assessment data should guide the School Based Team in determining whether additional Level C testing is required to answer questions about a student's learning profile and how to best support learning.

K-2 NUMERACY ASSESSMENT

Focus of project:

The focus of this district project was the development of district language and supports around early assessment in the area of numeracy. The range of grades of focus are K-2, but may also be supportive for educators working with older students with a beginning level of numeracy development. Whole class and individual student profiles maybe be created beginning at the end of Kindergarten.

What is numeracy?

Numeracy is the application and transfer of mathematical understanding to contextualized situations and problems. For our purposes, we are looking at one aspect of mathematical understanding – number sense.

From a cognitive science perspective, particularly in the area of early numeracy, numeracy is focused on awareness of quantity, numbers and operations and the relationship between concrete, pictorial and symbolic forms.

Numeracy is a student's number sense as demonstrated through cardinality, ordinality, meaning of symbols, being able to link symbols to sets and understanding arithmetic operations.

from Dr. Ansari, Number Cognition Lab, Western University

In mathematics education, and as defined in the BC Curriculum framework, numeracy is an application of mathematical understanding.

Numeracy is the willingness and ability to interpret and apply mathematical understanding to solve problems in complex situations, and the perseverance to analyze and communicate these solutions in ways that are relevant to the given context.

from Dr. Peter Liljedahl (SFU) from the BC curriculum website

In Kindergarten through grade 2, the focus is on developing young children's number sense. Numeracy development occurs with opportunities to connect, apply and transfer this number sense to contextual situations or problems.

Foundational concepts/skills connected to the development of number sense:

- Counting including one-to-one, cardinality and conservation
- Symbolic and Visual Magnitude
- Subitizing
- Linking sets to numerals
- Decomposition of quantities

What are indicators of numeracy development?

- Understanding of number (number sense, fluency, flexibility)
- Application and transfer of mathematical understanding to contextual situations (e.g. stories, problems, play, investigations)
- Making connections (math to self, math to world, math to math)
- Development of mathematical vocabulary and language (e.g. comparative language such as more/less, before/after, greater than/less than)

For Kindergarten-grade 2, here are some recommendations for assessments that can be used by school teams:

Suggestions for Assessments:

BC Based Assessments	Norm-Referenced Assessments
SD22 Grade One Screener https://sites.google.com/view/bc-numeracy-network/assessment/how-do-i-know-what-my-students-know-can-do-and-understand/grade-1?authuser=0	Numeracy Screener http://www.numeracyscreener.org
BC Early Numeracy Assessment https://www2.gov.bc.ca/gov/content/education-training/k-12/teach/teaching-tools/math Hardcopy available in schools	Number Sense Screener Maryland, Brookes Publishing
	Give a Number Task (Ansari)

Compilation of resources to support assessment and interpret results can be found on the BC Numeracy Network website:

<https://sites.google.com/view/bc-numeracy-network/assessment?authuser=0>

The SD38 Numeracy Assessment Committee has developed a K-2 Assessment Tool and monitoring forms which are included in this package.

Two suggested numeracy tasks are also provided.

SD38 K-2 Numeracy Assessment Tool

The SD38 K-2 Numeracy Assessment Tool focuses on foundational concepts and skills that contribute to the development of number sense. The SD38 K-2 Numeracy Assessment Tool is intended to be used from the end of Kindergarten through grade 2 with a whole class of students to create class profiles and to reveal students that we might want to further assess for more information. It can also be used with students over time to monitor progress.

This assessment is focused on performance-based assessment with an interview aspect. No more than three students can be assessed at the same time, in order to get reliable information through observation and listening. Ideally, each student is assessed individually and this takes about 10-12 minutes a student.

Materials needed: counters that students can easily pick up/grab (such as Unifix cubes, for some students having the cubes all one colour is helpful), numeral cards, a square of cardstock or cardboard (about 10x10cm), group/class or individual recording sheet

Recording sheets can be used to record dates, range or limit of quantities/numbers, Yes/No or your own coding system.

Task 1: Place a collection of 16 counters on the table and ask student to count them: Please count all the cubes. After counting, ask: How many are there?

Observe and listen for: one-to-one correspondence, cardinality and sequence of number names. If count is incorrect, note where error is made.

For grade 2 students, first have them count 16 and then provide another collection of 34 to count to bridge over two decades.

Task 2: After the student has counted the 16 counters, rearrange them in another configuration and ask: How many are there? How do you know? (if they tell you 16). If student recounts counters, note this. If student says “I don’t know” or responds with an incorrect answer, note this.

Observe and listen for: conservation (“It’s still 16 because you didn’t add any or take any away.”)

Note: Tasks 1 and 2 can be “combined” and flow from one to another when focused on the quantity of 16.

Task 3: Place a small collection of counters in front of the child. Ask: Can you please grab three and show me? (Gesture a grab motion). If necessary, explain to student to grab the required amount without counting them. Put the cubes back in the collection and then repeat with quantities of 5 then 4.

Observe and listen for: counting vs subitizing and knowing small quantities

Task 4: Create a set of 8 counters and another set of 3 counters. Ask: Without touching or counting the counters, tell me which set has more. Repeat with 7 counters and 10 counters (opposite orientation from first part of task with smaller set first and greater set second).

Observe and listen for: visual magnitude comparison

Task 5: Place numeral cards for 9 and 2 on the table. Ask: Which is greater? (use larger, bigger, more if language seems to be a concern). Repeat with 6 and 8.

Observe and listen for: symbolic magnitude comparison

Task 6: Place 3 counters in a diagonal row on the table under a card. Lift the card for 1 second and then cover counters with a card. Ask: How many counters are there? How do you know?

Note: remind students not to try and count, to just say how many dots /counters they see.

Repeat with 4 counters in a regular dice pattern.

Repeat with 5 counters in regular dice pattern.

Repeat with 4 counters in irregular pattern.

Observe and listen for: instant recognition of dot patterns, connection to known dot patterns (dice, dominoes), conceptual subitizing ("I saw the five as a three and a two."), ability to subitize both regular and irregular dot patterns.

Task 7: Create separate sets of 3, 5 and 9 counters on the table. Lay out the numeral cards and ask: Can you match the numbers to the number of counters in each set? (rephrase as necessary for student understanding)
For grade 2 students, extend to 16 and 23 to see if they use the numeral cards as digits which suggests place value understanding.

Observe and listen for: ability to match symbol to quantity

Task 8: Give the student 5 counters and ask: What different ways can you make five? What parts make up five? How can you decompose five into parts? (use phrasing that is most familiar to your students). Can you think of any more? (if student seems to need prompting to continue with task)

As an extension: Have you found all the ways to make five?

Repeat for 10.

Note: If student seems to not understand what to do, model one way to make five such as showing the counters as 2 and 3.

Observe and listen for: ability to decompose into parts, random vs systematic approach, using more than two parts sometimes, oral explanation such as "3 and 2 make 5."

SD38 K-2 Assessment Tool

Task and Concept/Skill Correlation

Task	Concepts/Skills
one	one-to-one, counting sequence, cardinality
two	conservation
three	subitizing, "give me" showing three-ness, four-ness, five-ness
four	visual magnitude comparison
five	symbolic magnitude comparison
six	subitizing both regular and irregular dot patterns
seven	matching numeric symbol to quantity
eight	decomposing quantities

0

1

4

7

2

5

8

3

6

9

SD38 K-2 Numeracy Assessment Tool

Individual Student Record

one-to-one correspondence	
counting sequence (correct order and stability)	
cardinality to _____	
conservation y/n (indicate quantity)	
"give me" task (ie having three-ness)	
visual magnitude	
symbolic magnitude	
subitizing (indicate quantity)	
match symbol to quantity	
decompose (indicate quantity and number of parts)	

student name

student birthdate, grade

date of assessment

completed by

notes

SD38 K-2 Numeracy Tasks

The SD38 K-2 Numeracy Assessment Tool focuses on early learners' number sense and the development of foundational number concepts.

The following numeracy tasks are provided to be used in parallel with the assessment tool, to assess the ability of students to connect, apply and transfer their understanding of number concepts. The tasks are inspired by the problem-solving tasks from the BC Early Numeracy Project the K-3 Numeracy Tasks on Peter Liljedahl's website.

Sharing Cookies

"There are four plates and there are two cookies on each plate. What different ways could you and two friends share the cookies? Which way do you think is the most fair and why?"

Notes:

You may change to the context to two children instead of three.

You may choose to increase the quantity to 12 (four plates of three) or 24 (four plates of six) based on your knowledge of your students.

Have paper, pencils, crayons, small paper plates and Unifix cubes available for students to use if they choose.

Planning and Designing a Pet Habitat

"Design a habitat for a pet. What do you need to consider? What does this pet need? What size should it be? Make a plan and draw or build your habitat. Share your reasoning and thinking for your design."

Notes:

You may change the context to connect to your students' interests, for example, designing a pen for a farm animal.

Some students may choose to use standard units such as centimetres.

Have paper, pencils, crayons, rulers, blocks, popsicle sticks, Unifix cubes and other creating materials available for students to use if they choose.

SD38 K-2 Numeracy Assessment Tool

Support materials to be developed:

Glossary

References

Curriculum Connections

Progress Monitoring/Records

Link to District Assessment Guide

List of Related Assessment Tools

Understanding Mathematics

-support for pedagogical content knowledge development

Responsive Instruction