Handwashing Policy

Strands:	Suggested time:
Algebra Number Data Social Emotional Learning (SEL) Skills in Mathematics and the Mathematical Processes	3-5 Days
Topic:	**Grade:**
Collecting data and modelling a real world problem, in this case, the time needed for handwashing for an entire class.	7

Overall and Specific Expectations:

Algebra

- C4. apply the process of mathematical modelling to represent, analyse, make predictions, and provide insight into real-life situations
- C2. demonstrate an understanding of variables, expressions, equalities, and inequalities, and apply this understanding in various contexts
    - C2.3 solve equations that involve multiple terms, whole numbers, and decimal numbers in various contexts, and verify solutions

Number

- B2. use knowledge of numbers and operations to solve mathematical problems encountered in everyday life
    - B2.1 use the properties and order of operations, and the relationships between operations, to solve problems involving whole numbers, decimal numbers, fractions, ratios, rates, and percents, including those requiring multiple steps or multiple operations

Data

- D1. manage, analyse, and use data to make convincing arguments and informed decisions, in various contexts drawn from real life
    - D1.2 collect qualitative data and discrete and continuous quantitative data to answer questions of interest, and organize the sets of data as appropriate, including using percentages

Social Emotional Learning (SEL) Skills in Mathematics and the Mathematical Processes

- A1. Throughout this grade, in order to promote a positive identity as a math learner, to foster well-being and the ability to learn, build resilience, and thrive, students will apply, to the best of their ability, a variety of social-emotional learning skills to support their use of the mathematical processes and their learning in connection with the expectations in the other five strands of the mathematics curriculum.

  In this lesson, to the best of their ability, students will learn to **develop self-awareness and a sense of identity** and to **think critically and creatively** as they apply the mathematical processes **reflecting** (demonstrate that as they solve problems, they are pausing, looking back, and monitoring their thinking to help clarify their understanding) and **representing** (select from and create a variety of representations of mathematical ideas and apply them to solve problems) so they can see themselves as capable math learners, and strengthen their sense of ownership of their learning, as part of their emerging sense of identity and belonging and make connections between math and everyday contexts to help them to make informed judgements and decisions.

Learning Goals:	Success Criteria:
We are learning how to use mathematical tools and processes to create a model that represents a real-life situation.	I can ask questions that help me to understand the situation. I can identify and apply mathematical concepts that help me to build and verify my mathematical model. I can communicate assumptions I've made and explain how they impact my model.
We are learning how to write and solve equations.	I can write an equation using self-selected variables. I can solve equations involving multiple terms and verify my solutions.
We are learning how to collect and organize discrete and	I can collect data through observation and organize the sets of

continuous quantitative data to answer questions of interest and organize the sets of data as appropriate.	data as appropriate.
Prior Learning:	**Resources and Materials:**
In the past, students should have... Used the properties of operations to solve problems involving whole numbers, decimal numbers, ratios and percents. Solved equations that involve multiple terms and whole numbers and verified solutions. Determined the range as a measure of spread and the measures of central tendency for various data sets.	• Show Me the Science - Why Wash Your Hands? (Appendix 1) copies to distribute to students • The Process of Mathematical Modelling schema (Appendix 2) • Stopwatch or other tool to measure time, such as a phone or online stopwatch, at least one • OntarioMath.Support Webinar 3 - Mathematical Modelling  For online/hybrid learning, small groups could be set up ahead of time. This could be facilitated via breakout rooms, depending on the different district conferencing tools used. In the breakout rooms, students could work together to generate questions and make assumptions. They could use a virtual whiteboard to support their discussions, such as shared slides, Google Jamboard, Microsoft Whiteboard, Padlet depending on district tools (recording tool). This will also create a record of their work in order to communicate clearly with each other and the teacher. For virtual manipulatives, students can use the mathies website.  If students need to collect data (e.g., to time the time it takes for someone to wash their hands), they could do this at home with family members).

	 Upload copies of Appendix 1 and Appendix 2 ahead of time in your virtual learning environment (e.g., Microsoft Teams, Google Classroom, D2L).

Learning and Teaching Activities:

Understand the Situation		
	Teacher Moves: The teacher will present the situation: In the late 1980's there was a film about a high-school student who has an uncanny skill at skipping classes and getting away with it. Intending to make one last duck-out before graduation he calls in sick, "borrows" a Ferrari, and embarks on a one-day journey through the streets of Chicago. On his trail is high school principal Rooney, who is determined to catch him in the act. (Google synopsis) The teacher will explain to students that in its day, this was a very popular movie and ask students to consider why it might have been so popular and to share their ideas. The teacher will explain that while our movie hero might have skipped school, there are	

	many reasons students are absent from school. The teacher will ask students to identify some reasons they and other students might be absent from school and note the ideas on the board. The teacher will ask students to estimate the percentage of absences related to common contagious illnesses and explain that the incidence of these types of illnesses can be reduced through frequent and proper hand cleaning. The teacher will provide students with a copy of "Show Me the Science - Why Wash Your Hands?" and allow students time to read. The teacher will explain to students that schools are always looking to improve student health and learning. Preventing the spread of illnesses such as the cold and flu will keep kids and their families healthier and improve learning outcomes since absences will be reduced. The teacher will explain to students a school board is considering mandating scheduled hand cleaning several times a day. In order to better understand the impact of this policy, it wants to determine what	**Opportunities for Differentiation** Task could be simplified by asking students to create a model that predicts the time it takes for a class to wash their hands.

<table>
<tr>
<td>Students will generate questions about the situation that need answering.

Students may generate questions as a whole class or as small groups of 3 - 4 students, then share, round-robin style, until all questions have been captured by the teacher.
  Use virtual breakout rooms and the recording tool.</td>
<td>percentage of instructional time would be lost due to this schedule.

The teacher will capture student questions and listen for assumptions and misconceptions about the situation.</td>
<td rowspan="3">Opportunities for Assessment
<u>Observation/Conversation</u>
Students are able to generate questions.
Students identify and justify their assumptions.</td>
</tr>
<tr>
<td colspan="2">Analyse the Situation</td>
</tr>
<tr>
<td>With the teacher’s guidance, students will narrow down the initial list of questions.

  Use the recording tool to narrow down the list of questions.

Of the questions that remain, students will brainstorm what information they have and what information they would need to be able to answer these questions.</td>
<td>Teacher Moves:
The teacher will guide students in narrowing down the list of questions:
● Are some questions the same?
● Do some questions already have known answers?

The teacher will help the students cull the list of questions so that only a few remain. For example:
● How much time does it take for one class to wash their hands?</td>
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With the teacher's guidance, students will identify those questions that have a mathematical component	• How much instructional time is there in a day? • How many times should a class wash their hands in a day? The teacher will guide students in recognizing the many ways that mathematics can be used to enable us to better understand the situation. • Can mathematics be used to gather information that we need? • Can mathematics be used to analyse the information we have gathered? • What quantities or measurements are required to answer the question? • What quantities or measurements do we know? • Which quantities or measurements will always stay the same (constant/invariant)? • Which quantities or measurements could change (variable)? Can these take on any value, or is there a range of acceptable/realistic values within which these quantities or measurements must lie (constraints)? • How could we get information about the quantities/measurements we don't know?	

	• Will we have to make any assumptions in order to proceed? For example:
	  ○ I assume it will take _ min. per student to wash their hands.
	  ○ I assume that it would be better if we weren't all in line.
	  ○ I assume that there will need to be some time in between each student.
	  ○ I assume students need to use a sink and not just hand sanitizer
	  ○ I assume no instruction happens as students are washing hands	

Create a Mathematical Model		
Students will use mathematical tools to develop a plan to minimize classroom interruptions, while allowing ample time for each student to wash their hands. They will record all assumptions they are making. They will record all new information they have gathered and how they acquired that information.	**Teacher moves:** The teacher will look for any misconceptions. They will decide if any are common enough to call to the attention of the entire class, or they can be addressed individually or within the group. The teacher will look out for students who really need to revisit “understand the problem” or “analyse the situation” (Are	

Students will mathematically justify all estimations and numerical values (either given, researched, or calculated) in their plan. Students' models will be useful to plan for minimized disruptions and predict how long these disruptions will take.	students struggling with creating a plan because there is something about the situation that they do not fully understand? Are they struggling because they need to make an assumption to narrow down the problem? Did they make an unnecessary assumption that is preventing them from making a fulsome model?) The teacher will decide when would be a good time to have the groups share their progress. Examples of natural checkpoints: ● Students have gathered data. ● Students have organized data. ● Students have created a first mathematical model.  Use multiple rooms in your videoconferencing tool to have groups share their progress. As groups share their progress, the teacher will question students to help them to reflect on their strengths and their emotions. For example: ● What feelings came up as you were building your model? How did they change over time?	**Opportunities for Differentiation** Students may observe someone or a class washing their hands before creating the model. **Opportunities for Assessment** <u>Observation and Conversation</u> Students effectively create a model by identifying needed information, using effective strategies and appropriate tools and making links to other situations and other math concepts. Students communicate their ideas and their reasoning clearly, using appropriate vocabulary. Students apply the following, as necessary and appropriate for their model: ● use the order of operations and the relationships between operations to solve problems including whole numbers, decimal numbers and percentages ● solve equations that involve multiple terms ● collect qualitative data and discrete and continuous quantitative data to answer questions of interest, and organize the sets of data

<table>
<tr><td></td><td>What strength does each group member apply to the process? How did this help you to reach your objective?
What was the most interesting part of the modelling process so far? Why?</td><td rowspan="3">Opportunities for Differentiation
Assist students in organizing their information, providing appropriate strategies or graphic organizers as necessary.
Provide direct instruction, as necessary, on:
Writing equations
Using variables
Calculating measures of central tendency
Opportunities for Assessment
<u>Observation/Conversation:</u>
Students evaluate the accuracy of their model.
Students modify their model to better represent new information.</td></tr>
<tr><td colspan="2">Analyse and Assess the Model</td></tr>
<tr><td>Students will use their model to predict the number of minutes it will take their class to wash their hands.

A member of each group will write the answer on a sticky-note and place their sticky-notes in ascending order on the board.

Students describe their models to the class, including any assumptions they’ve made.

Students play-out a handwashing break.</td><td>Teacher moves
The teacher will ask students to use their model to determine the number of minutes they predict the class will take to wash their hands.

The teacher will guide a discussion as to why there might be differences in the predictions.

The teacher will ask students to present their models.
The teacher will guide students in identifying similarities and differences between the models and any assumptions that have been made.

The teacher will guide the group through a handwashing break, timing the experience and present the time to students.</td></tr>
</table>

Students discuss, in their groups, the difference between their calculation and the experiential result. Students evaluate the accuracy of their model. ● Did our assumptions make sense? ● Did we miss important pieces to consider? Students can modify their model, given the new information. Students will reflect on, be prepared to justify and present their opinion on the board policy based on the information provided by their model.	 Students at home can play out a handwashing break with their family members to test out the model. The teacher will help students to develop their presentation. ● What mathematical tools did you use, and how did they help solve the problem? ● Are there situations where your solution wouldn't work or your model wouldn't apply? Describe these. ● What changes would you need to make to your model so that it could be applied to more situations? ● If you had more time, what else might you do?	**Opportunities for assessment:** <u>Production</u> Students develop and present an opinion using mathematical arguments based on their mathematical models. Students demonstrate an understanding of mathematical modelling, including its limits.
Consolidation of Learning		

Students will explain their model and present their opinions on the board policy based on the information provided by their model.  Use your videoconferencing tool to have groups explain their model. With the teacher's support, students will identify any commonalities among the presentations. With the teacher's support, students will reflect on the process of mathematical modelling and contribute their ideas to the development of a classroom Process of Mathematical Modelling schema.	**Teacher moves:** The teacher will note and summarize all the mathematics that was developed during the previous parts of the lesson, including the student's reflections on the mathematical modelling process. The teacher will present the students with the Process of Mathematical Modelling schema (Appendix 2) and ask them to what degree it represents the process they undertook. The teacher will further students' reflections on the mathematical process by asking questions, such as: ● What is important about this process? ● In what way are assumptions key to an effective model? ● To what extent was our model helpful? Allow students to add their own ideas, questions and reminders to the schema.	
Further Consolidation/Next Steps for students and teachers		
Students may be given the opportunity to revise their mathematical models after the whole class has completed their presentations and feedback has been shared. If possible, the teacher will allow students to repeat the "predict and verify" process with other classes in the school.		

- Students collect and share the data needed to make a prediction using their model (ex., the number of students in the class, the distance from the washroom, etc.)
- Students use the data to make predictions based on their model.
- Students (individually, as a small group or whole class) observe the class washing their hands, note their observations and time the experience.
- Students share data as necessary.
- Students compare their predicted time to the actual time.
- As a group, students discuss the accuracy of their models. Allow students to continue to modify their models based on new information.

Appendix 1

Show Me the Science - Why Wash Your Hands?

Keeping hands clean is one of the most important steps we can take to avoid getting sick and spreading germs to others. Many diseases and conditions are spread by not washing hands with soap and clean, running water.

Germs can get onto hands after people use the toilet, but also in less obvious ways. They can get onto hands if people touch any object that has germs on it because someone coughed or sneezed on it or was touched by some other contaminated object. When these germs get onto hands and are not washed off, they can be passed from person to person and make people sick. Washing hands prevents illnesses and spread of infections to others.
Handwashing with soap removes germs from hands. This helps prevent infections because:

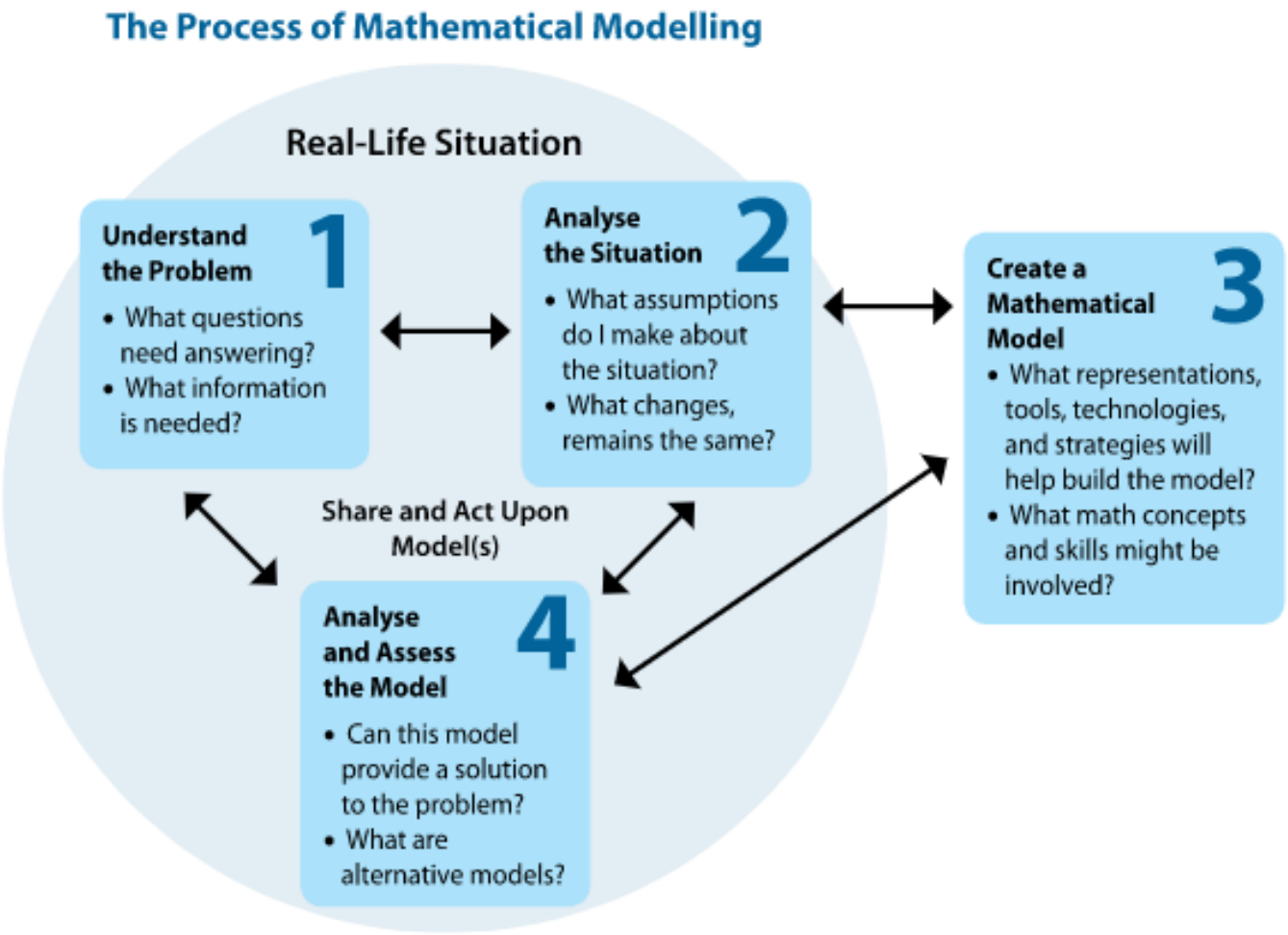
- People frequently touch their eyes, nose, and mouth without even realizing it. Germs can get into the body through the eyes, nose and mouth and make us sick.
- Germs from unwashed hands can get into foods and drinks while people prepare or consume them. Germs can multiply in some types of foods or drinks, under certain conditions, and make people sick.
- Germs from unwashed hands can be transferred to other objects, like handrails, table tops, or toys, and then transferred to another person's hands.

Teaching people about handwashing helps them and their communities stay healthy. Handwashing education in the community:

- Reduces respiratory illnesses, like colds, in the general population by 16-21%
- Reduces absenteeism due to gastrointestinal illness in schoolchildren by 29-57%
- Handwashing education and access to soap in schools can help improve attendance.
- Good handwashing early in life may help improve child development in some settings.

Centers for Disease Control and Prevention (2020). Show Me the Science - Why Wash Your Hands? Online.

Appendix 2


The Process of Mathematical Modelling
Real-Life Situation
Understand the Problem
1
• What questions need answering?
• What information is needed?
Analyse the Situation
2
• What assumptions do I make about the situation?
• What changes, remains the same?
Create a Mathematical Model
3
• What representations, tools, technologies, and strategies will help build the model?
• What math concepts and skills might be involved?
Share and Act Upon Model(s)
Analyse and Assess the Model
4
• Can this model provide a solution to the problem?
• What are alternative models?