Wondering in the neighborhood

In the first days of class we follow a Math Trail through our neighborhood. Student teams bring along cameras, note paper and clip boards. As we go we look for examples of math in our community. At first students pick out the basics: shapes and numbers, but as we continue along they begin to adopt a mathematical point of view. They wonder about the influence of math in the construction of buildings, in operating a business, in the planning of roads and intersections, in the patterns of nature and in the social life of the community.

Their task is to snap a photo that illustrates a problematic situation and ask a question.

On the Map

Once back in class, each question, along with its photo, is added to our map as a pin marking the location in our community. We respond to each question. A response is not an answer, it is a window opening to more questions and ideas. Some questions will become springboards for larger explorations that we can use as a context for learning mathematical concepts. In some cases we won't be able to gather the specific information needed to reach a formal solution. What is important in a response is that the students share their ideas, and that those ideas develop into a process, a way of looking at the world with curiosity and wonder that leads to a place of reason and understanding.

For each student question we ask what do we know about this situation? What would we need to do to answer this question? What tools would we need? Who would benefit from knowing the answer? What will we learn by finding the solution? Are there similarities between this problem and one we've solved before? Can we use a similar strategy or process or do we need to try a new one? Responding to these open, ill defined, authentic problems supports the learning of content as well as communication skills, reasoning and critical thinking. These problems that originated in our neighborhoods illustrate the interconnectedness of the mathematical concepts and their relevance to our lives.

Out on a Learning Path

While out in our neighborhood one student wondered about the number of cars travelling along a stretch of busy road. This got us thinking about traffic patterns, the number of people in each vehicle as opposed to a transit bus, fuel efficiency, and carbon dioxide emissions which are a perfect match to curricular outcomes of measurement, statistics, ratio, rate, and volume.

Another student noticed that a house was getting a new roof. This got us thinking about building materials, building codes, the angle of the roof, inches and centimeters, flooring, paint and baseboards. Answering these questions supported the learning of curricular outcomes relating to area, perimeter, angles, triangles, best buys, rate and unit conversions involving metric and imperial measurements.

We passed a local music store billboard that claimed that students who play an instrument are better at math than those who don't. This sparked a heated debate. We developed our understanding of fractions, rate, patterns and volume in our arguments for and against the music store's claim.

Through their own questions students come to understand that the problems we face in our lives are not prewritten in a text, nor do they come with all the variables neatly defined. Learning to work with ill-defined, open and messy problems means learning to think like a mathematician, learning to look beyond the first picture to see what else may be influencing the problematic nature of this situation. Seeing a problem in context lets us step in, becoming characters in the story, rather than playing the role of the passive audience.

"When building this step, what was important to consider?"

"Why does the top of the deck look level but the front of the deck look like it is unleveled?"

"How many cars pass by here in a day?"

"If we knew how many cars went by could we find out how much pollution that is?"

"What are 'traffic patterns?"

"How many windows does this side of the building have?"

"What's the best way to count the windows?"

"How fast does the Ferris wheel go?"

"If we get stuck at the top, how high up will we be?"

"How do we know that we won't fall?"

"How many people can ride the Ferris wheel at one time?"

"If I have to pay $2.50 an hour how much will I pay if I stay all day?"

"I can park in the Parkade for $2 for the first hour and then $0.75 cents each additional hour. At what point is it better to park on the street for $2.50 and hour?"

"How much money does the company earn each day from parking?"

For a more guided option students can prepare a list ahead of time so that they know what to look for. Their observations can be captured with a photo and then organized together to create a mathematical dictionary or reference book for which the students are the authors. This book can also serve as a tool for making connections to new topics or as a reference for others to tour through the neighborhood. Look for windows that make arrays, similar figures in the peaks of a roof or a doorway, ways to determine the rate at which a bird flies or a person walks, ways to reason the age of a tree, environmental print and advertisements that include prices, discounts and rates. Ideas, questions and problems that arise during a math trail can be further explored or the conversation can focus on what we would like to know, how we might go about finding the answer, what information would we need and how we could collect that information.

MATH TRAIL

I'm looking for	I saw	Sketch
An Array	A window with panes. There were four rows and three columns per window.	
A Right Triangle		
A Fraction		
A Decimal	The price on a sign at a gas station. It says price per litre.	

I see...

I'm wondering...

Skate Park — The Forks

1. What do we already know about this situation?

2. What would we need to do to find a solution?

3. What tools would we need?

4. Who would benefit from knowing the answer?

5. What will we learn by finding the answer?

6. Are there similarities between this problem and one we've tried before?

7. Can we use a similar strategy or process or do we need to try a new one?