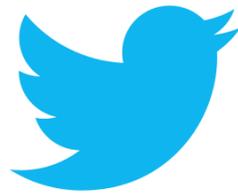


Math is Everywhere!

Dawn Butson



@DL_Buts



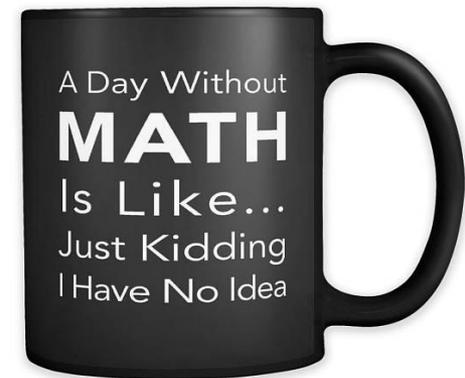
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Learning Goal of this session:

To share ideas about how to bring critical thinking, problem solving, and real world math together so students learn to look at their world through a math lens.



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Questions to think about....

What does “real world math” mean to you? Your students?

How do you incorporate real world math into your teaching and learning?



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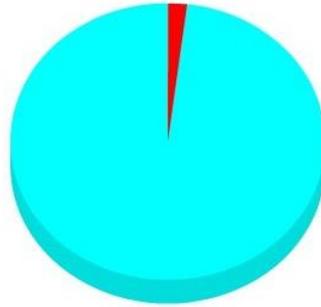


These are the types of guys you read about in math problems...



Alan buys 19 melons 🤔😂😭😞

Why I would use math in real life



- Other
- I end up being a math teacher

do you know that awesome feeling, when you finally understand math?



Me neither

How I see math word problems: If you have 4 pencils and I have 7 apples, how many pancakes will fit on the roof? Purple, because aliens don't wear hats.



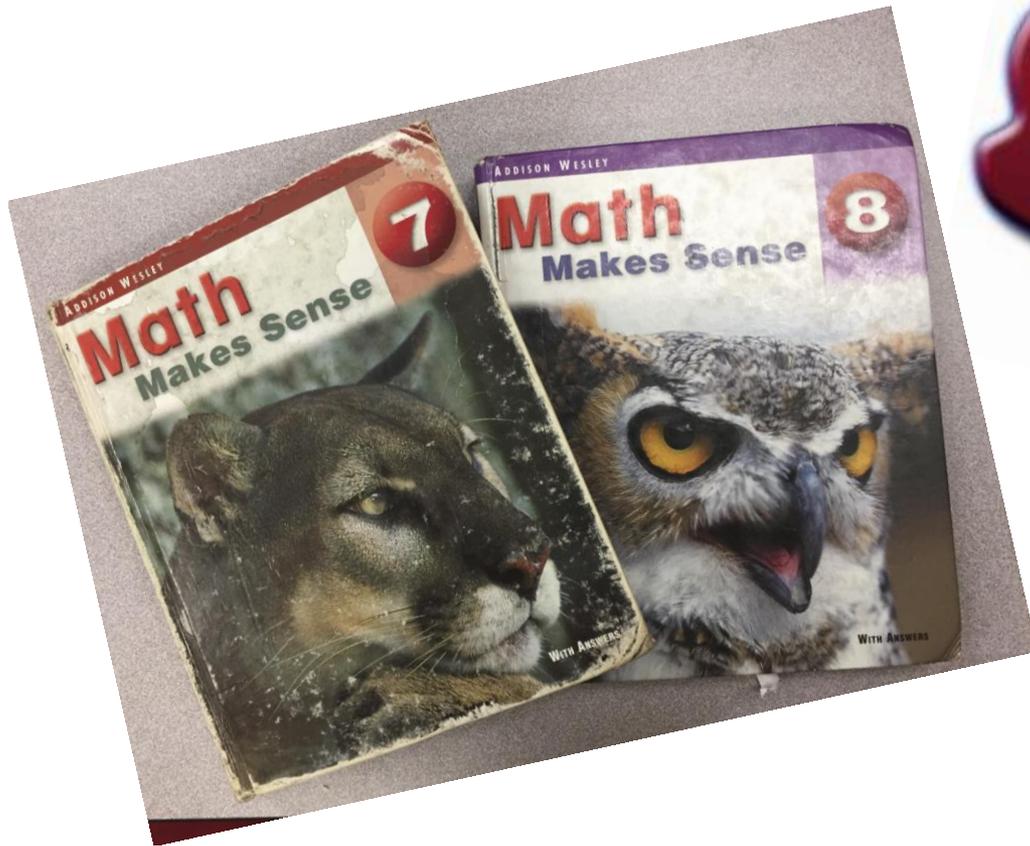
Math:

the only place where people buy 60 watermelons and no one wonders why!



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The culprit...



When will we ever use this in the real world?



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A solution...



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3 important components:

Critical Thinking

- Evaluating information, constructing meaningful knowledge, and applying it in the real world.

Problem Solving

- Examining and thinking logically about new situations, how to complete a task, achieve a goal, or make a decision.

Real World Math

- Making mathematical connections to a situation or event from our (students) world.

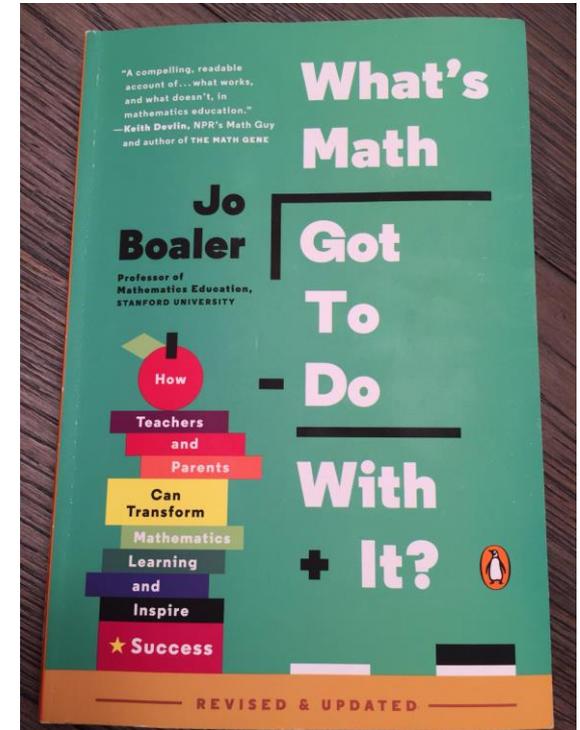


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“There are two versions of math in the lives of many Americans: the strange and boring subject that they encountered in classrooms, and an interesting set of ideas that is the math of the world and is curiously different and surprisingly engaging. Our task is to introduce this second version to today’s students, get them excited about math, and prepare them for the future.” (page 5)



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Mathematical Mindsets

by Jo Boaler

“Students rarely think that they are in math classrooms to appreciate the beauty of mathematics, to ask deep questions, to explore the rich set of connections that make up the subject, or even to learn about the applicability of the subject; they think they are in math classrooms to perform.”

“... school mathematics has become so far removed from real mathematics...”

“...school math is widely hated, but the mathematics of life, work, and leisure is intriguing and much more enjoyable.

“I strongly believe that if school math classrooms presented the true nature of the discipline, we would not have this nationwide dislike of math and widespread math underachievement.”



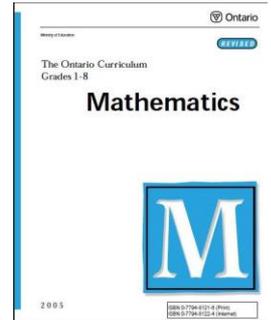
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How do I know what to do?

New Pedagogies for Deeper Learning



COLLABORATION



CREATIVITY



CRITICAL THINKING



CITIZENSHIP



CHARACTER



COMMUNICATION

Vision for the Mathematics Learner

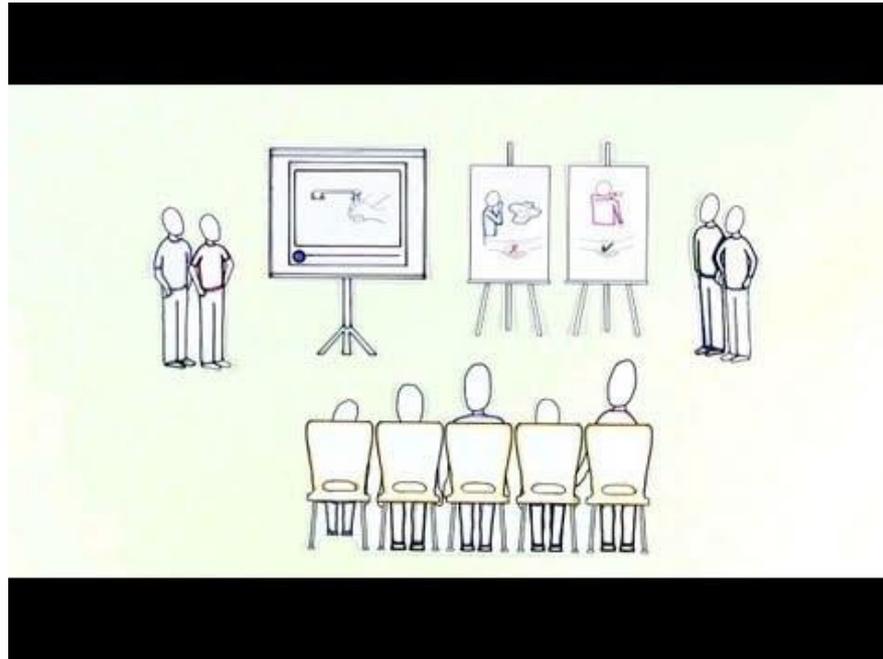


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Project Based Learning (PBL)



http://www.bie.org/object/video/project_based_learning_explained



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Our Project:

Who has had worse winter storms in 2017/2018...Canada or US?

The purpose was to develop problem-solving skills and math process, not to master the math content.



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Math Inquiry: Grade 7/8

Who has had worse winter storms in 2017/2018...Canada or US?

Learning goal: to apply mathematical knowledge to form an opinion about a real life situation.

Engage: What do you notice? What do you wonder?
<https://www.youtube.com/watch?v=2gYcXkpb6Zk>

Explore: Ask lots of questions! Think critically! What do you need to know in order to formulate your opinion? Collect primary data. Research secondary data. Use a Google form to create a survey to see what others think about whose storms are bigger? Conduct your survey and make conclusions based on the results. Show this data in a graph to **represent** your survey results. Do some online research to learn about the topic (ex. Weather network, news broadcasts, etc.). Curate your resources in a Google Doc.

Apply: Use what you have learned in your research to **formulate** a concrete answer. **Defend** your opinion with research and the application of mathematical concepts. (**Extra challenge:** Create a short video explaining your opinion. Use the green screen to add a creative element to your video.) Include two different maps that help **prove** your point and **represent** your ideas. **Explain** what the maps show and how they support your opinion.

Create: Put your information together to **create** an electronic display of your learning. This may be a Google Slide presentation, a Google Doc or something else of your choice. **Communicate** using math vocabulary and terminology. Remember, you are looking at this issue through a math lens. Be sure to include all the requirements as evidence of your learning.

Share: Now it time to share your learning and ideas with others. We will decide together how this will look. *Some ideas might be: share digitally with peers, parents and/or teacher, post on your blog, present to the class, or share with small groups.*

Reflect: What is the most interesting thing I learned? What math concept helped me the most when forming my opinion? What did I work hardest at? What is one thing I hope others notice about my work? What level do I deserve on this project and why?

What math might I learn about in this inquiry project:

- rate, proportions, algebra, variables, integers, decimals, patterns, graphing, conducting a survey, percents, units, measurement, mean, median, mode, spatial reasoning.

Assessment

Success Criteria:

- I formulated an opinion based on mathematical information and data.
- I supported my opinion with relevant research.
- I defended my thinking / answer with strong evidence / reasons.
- I created an electronic display of my learning and shared it with an audience.
- I reflected upon my work in a meaningful manner.

Criteria	Level 1	Level 2	Level 3	Level 4
Thinking -problem solving -justification of answers	Does not justify answers to problems. Uses limited details and minimal evidence of understanding.	Attempts to justify answers, using some detail and minimal evidence.	Uses logical thinking to justify answers, using detail and evidence of understanding.	Always uses logical thinking to thoroughly justify answers, using great detail and ample evidence of understanding.
Application - formulates solutions to problems making connections to what he/she has learned	Has great difficulty connecting knowledge and skills to solve problem/ form opinion.	Has some difficulty connecting knowledge and skills to solve problem/ form opinion.	Connects knowledge and skills to solve problem/ form opinion.	Connects knowledge and skills to solve problem/ form opinion with great accuracy and detail.



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Assessment

Math Processes

Process Expectation	Still working on it!	Getting it!	Got it!
Problem Solving (T) -uses critical thinking to solve problems			
Reasoning and Proving (T) -makes inference, draws conclusions, and justifies thinking/answers/opinions			
Representing (C) -represents the problem/solution in various ways <i>(ex. numbers, words, pictures, manipulatives, models, graphs, technology, etc.)</i>			
Communicating (C) -explains and justifies using clear language, math vocabulary, symbols, and correct units			
Reflecting (T) -thinks about the reasonableness of an answer, uses metacognitive skills			
Connecting (A) -makes connections between concepts and relates ideas to other situations			



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Assessment

Conferences ☆

File Edit View Insert Format Data Tools Add-ons Help All changes saved in Drive

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	A	B	C	D	E	F	G	H	I	J	K
1		Name	Graphic Organizer	Research	Started Product	Feedback					
2	9:10 AM	Michelle									
3	9:20 AM	Amy									
4	9:30 AM	Nadine									
5	9:40 AM	Lisa									
6	11:00 AM	Carlene									
7	11:10 AM	Calvin									
8											
9	9:00 AM	Kean									
10	9:10 AM	Jacob									
11	9:40 AM	Emma									
12											
13	2:15 PM	Jorja									
14	2:30 PM	Simon									
15											
16	2:10 PM	Nathan									
17	2:20 PM	Keanu									
18	2:30 PM	Mai									
19	2:40 PM	Kate									
20	2:50 PM	Sam									
21		Elgin									
22											



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Organizing my thoughts...

I think _____ the United States _____ has had the worst winter storms this year.

The reasons I think this are:

1. Canada has had more storms but the US storms are more severe.
2. In the United states buffalo gets more snow and has worse storms than any place in Canada because of lake effect.
3. This year more cold air has been pushed to the south.

Some facts or stats that I am going to use to support my ideas are:

Buffalo is 138 mil/222.089km to the east of lake erie which means when the lake is warm and the air temperature is cold the water starts evaporating into the cold air, which the evaporated water then turns into snow, and gets dumped on buffalo from the wind as it goes from west to east. Also known as lake effect. In the winter of 2013 Toronto received winds up to 90 kilometers/~56 miles an hour. Winds like these will push the snow from lake effect to buffalo each year.(55.9234mil~56 mil)

Most of the east coast was under winter storm watches or warnings as they had one of the coldest holiday seasons on record this winter. Minnesota, and international falls residence faced negative 36 degrees fahrenheit/~2.22 degrees celsius breaking the previous low record of negative 32 degrees fahrenheit/0 degrees celsius in 1924.

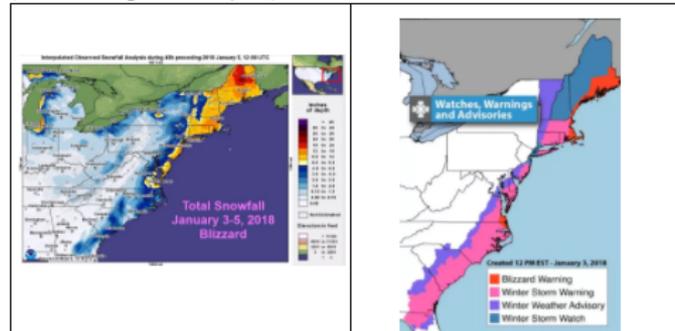
All most The whole east coast has been covered in a sheet of snow. Over a foot of snow was dumped on New england, with dangerous, icy, coastal floodings, and damaging winds from rapidly intensifying storms.

Canada	USA
https://www.theweathernetwork.com/us/alerts/ca	https://www.theweathernetwork.com/us/alerts
https://www.youtube.com/watch?v=Y54CtkgSE4s	http://www.cnn.com/2017/10/19/us/winter-outlook/index.html
https://www.thestar.com/news/canada/2017/12/27/po-wer-being-restored-in-nova-scotia-newfoundland-and-er-wind-warning-after-winter-storm-hits-atlantic-canda.html	https://accuweather.brightspotcdn.com/67/6f/ef75e7f4c102a4b1cb87717a5db8/2017-2018-us-winter-highlights.jpg
https://accuweather.brightspotcdn.com/33/31/92f35f5d45df889483a4f1fa60b5/canada-winter-17-18-highlights.jpg	https://www.youtube.com/watch?v=Cj_vlkzJ6c8
https://www.ctvnews.ca/	http://www.dw.com/en/powerful-bomb-cyclone-winter-storm-hits-us-east-coast/a-42033399
http://www.cbc.ca/news/canada/blasts-from-the-past-canada-s-worst-snowstorms-1.1370387	https://weather.com/science/weather-explainers/news/monthly-seasonal-daily-snowfall-records-united-states
	https://weather.com/en-CA/canada/news/news/2017-12-31-snow-bitter-cold-deadly-winter-storm-frankie
	https://mediaassets.news5cleveland.com/photo/2017/12/29/download_1514592587116_75090730_ver1.0_640_480.jpg
	https://docs.google.com/document/d/1q4nVJgs3HlNt-36kM-1M9-3-2V4-3T0T-3-3892-3-33

In 2017 Erie, pennsylvania, in the U.S broke the previous city record for snowfall in just a single day, with 34 inches/86.36 centimeters of snow on Christmas day. The previous snowfall record of 8.1 inches/20.574 centimeters fell on erie more than four times this Christmas day. Erie also broke the record for most amount of snowfall in just one day this christmas with 14 more inches of snow then the previous record that was set on November 22, 1956 with 20 inches/50.8 centimeters of snow.

Buffalos average snowfall for 2018 is 5.06 centimeters and toronto's average snowfall for 2018 is 0 centimeters. Buffalo has had 5.06 more centimeters of snow then toronto this january.

The two maps that I am going to use to show evidence of my opinion are:
(insert link or give a description)



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Student Work Samples



Winter Snowstorms- USA

By: Je

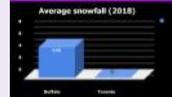
Buffalo's Lake Effect Snow



East Coast Cold



Toronto vs Buffalo (snowfall and temperature)



My opinion

Canada is known for its cold winter weather, but what about the United States? Who would ever think that the U.S would have a worse winter than Canada, well I do and here's why...

My reasons are...

- Canada has had more storms but the U.S storms are more severe.
- Places that normally don't get any snow or cold temperatures have been under a state of emergency this winter.
- More of the cold air has been pushed to the south this year.
- Places like Buffalo, U.S, normally get more snow than any place in Canada during the winter.



Average amount of annual snowfall for the US and Canada...

- Canada gets an average of about 179.49 cm each year.
- The United States gets an average of about 62.58 in each year. (62.58in is equivalent to 158.9532cm-158.95cm)

When I was finding the mean of the US annual snowfall, I came across some cities that annually don't receive any snow. So I removed them from the amount of cities in the US. This was because they were outlier numbers that would affect the correct total average for snowfall in the US.

<https://www.accuweather.com/en/weather-news/2017-2018-us-winter-forecast/70002894> < Video

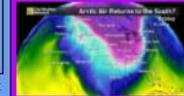
Northeast Weather



Erie, Pennsylvania record breaking winter



Florida and Georgia unpredictable weather



Which storms are bigger?

What country do you think had worse/bigger storms?

- Canada
- United States

SUBMIT

Thousands of flight cancellations throughout the US due to Iga and many houses and facilities without power! (Click on top picture to learn more)

Winter Snowstorm Iga has killed at least 16 people in the South! (click on picture to learn more)

"Eastern Massachusetts and most of Rhode Island bracing for as much as 18 inches of snow, with snow falling at a rate of 1 inches per hour possible." National Post, Jan. 4 2018 (Click picture to learn more)

There has been snow on palm trees in the East Coast and frozen Spanas. Killing tree trees on Florida! (Click on the picture to learn more)

Snowfall Averages For January!

(Click picture to learn more and see the enlarged version of the chart!)

WHOSE SNOWSTORMS ARE BIGGER CANADA OR THE US?

In my opinion I think that both Canada and the US have had bad snowstorms this year but that the US storms have been worse. Here's why:

- There have been many snowstorms in unusual places in the US
- People in Canada are used to harsh winters whereas people in the US were amazed that they got over a few centimeters of snow because it's so abnormal for them
- Canada's snowstorms are colder and happen more frequently but in the US they are more extreme and cause more damage and distress because people aren't prepared for the storms like we are in Canada
- People have died in the US because of storm-related causes and winter-related illnesses
- There have been record high rates of snowfall in the US
- Many places in the US are in distress and in a state of emergency because of the destruction the bomb cyclone/iga has caused
- The winter storm Iga is so big it looks like a hurricane from space
- Two major snowstorms, Grayson and Iga originated in the US, when they got to Canada they had much less disastrous results than when they were in the US.

Conclusion

Over all this year, after comparing snowfalls in the US to Canada's and comparing this year's temperatures to past ones in the US, along with numerous other incidents in the US. Also, looking at the survey asking which country has the worst snowstorms completed by my classmates, I have come to the conclusion that the US's snow storms are worse than Canada's. For all the reasons shown

Since December, more winter storms have originated in the US than Canada! (click picture to see the chart and graph)

State of Emergency in Georgia and 3 other US States! (click on the top image to learn more)

Snow Storm Iga Causes Temperatures at a Snowfall Breaking Snowfall and Snowfall rate Takes Over in Erie, Pennsylvania Along with Record Breaking Cold in New York! (click on the picture to learn more)

Lake Effect Takes Place in Erie! Record Breaking Snowfall and Snowfall rate Takes Over in Erie, Pennsylvania Along with Record Breaking Cold in New York! (click on the picture to learn more)

US Winter Temperatures Drop Drastically, Chart Shows! (Click picture to learn more and see the chart!)

Survey: Whose Snow Storms are Bigger Canada or the US?



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Math Thinking

Secondary data (click on the pictures for my explanation)

Annual Mean Total Snowfall

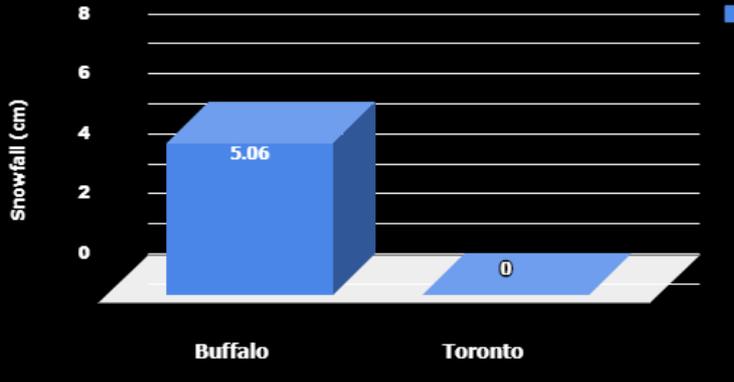


I chose to use this graph showing the annual mean (average) total snowfall in each of the states the map was published in 2015 which they had a massive blizzard that winter. I chose to use this map to see changes between the years for example Erie in Pennsylvania 1.6 meters of snow fell in one night which the average in Pennsylvania 275 cm (2.75 meters) the annual mean total snowfall in 2015 was 12.1-24.0 which is 30-60 cm so just in one day more snowfall fell than the average as well the average now 2017-2018. I as well chose this map to help explain my thinking because it shows me the average mean total snowfall in each state then and now I can research and see what the mean total snowfall is now and see if anything has changed such as snowfall or decreased.

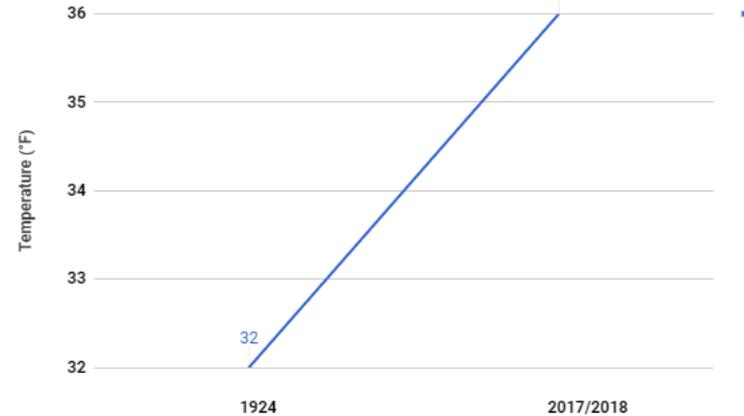
Annual Mean Total Snowfall



Average snowfall (2018)



East coast temperature records



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Final Product

Which Country Has Bigger Storms?



VS



Although when first asked this question my immediate answer was "well it has to be Canada!?" I think that in 2017 and the start of 2018 the United States have endured a worse winter and these are my three main reasons why:

- United States have had much bigger/worse storms and more snow
- United States weather is much more unpredictable



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Successes

Students:

- were interested in the topic
- were very good at forming their opinion
- moved forward with technology (ex. hyperdocs, Google Sheets)
- were creative (display of work, showing their thinking)
- showed improvement in their ability to think flexibly
- used class time extremely well
- worked at levels appropriate for them
- used feedback from conferences



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Student Misconceptions

- Problem solving means finding an answer
- Math is not needed to understand the world
- Math is not regularly seen in their everyday life
- You can't look at weather with math because it is science



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Challenges

- Understanding “critical thinking”
- “We’ve never had to do research for math before.”
- “I don’t understand how this is math.”
- Seeing the issue through a math lens.
- Using math, not science, geography or prior knowledge.

How did we overcome these challenges?

GROWTH MINDSET

“Failure is an opportunity to grow”

**GROWTH
MINDSET**

“I can learn to do anything I want”

“Challenges help me to grow”

“My effort and attitude determine my abilities”

“Feedback is constructive”

“I am inspired by the success of others”

“I like to try new things”



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W E B E X P E R I E N C E

Next Steps

My challenge to you is to use the upcoming winter Olympics to drive your math teaching and learning.

This real life event is a perfect opportunity to allow students to think about real world events with a mathematical lens.



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Questions or comments?

Thank you!



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