

GRADE 10 MATHEMATICS: Data Analysis Project

Summary of Learning Opportunity

My goal was to create an open-ended assignment that taught students the skill of interpreting data. The curricular competency of Modelling mathematics in situational contexts is complex and contains many embedded thinking skills. I broke this large competency down into smaller thinking skills using the Cross Curricular Numeracy Learning Progressions. I began with a structured task that guided students in analyzing Elections Canada data, which helped them understand the process and product I was expecting for their final assessment, to analyze a Statistics Canada dataset based on their own inquiry question. I was intrigued to see that most students grasped the task and successfully extracted relevant data. Many were able to create graphs that represented the information effectively. However, some students had difficulty representing patterns in the data with processed graphics. This will definitely be an area of focus in my future lesson and unit planning. I would also like to revisit this project next school year, focusing on enhancing the communication aspect of the assignment and having students more clearly explain their thinking process and decisions.

Math 10
Foundations
and Pre-
calculus

Learning
Standards

- Model with mathematics in situational contexts
- Represent mathematical ideas in concrete, pictorial and symbolic forms
- Reflect on mathematical thinking

Numeracy Connections

Instruction

Competencies Developed and Practiced

Formative activity: Building data analysis skills through structured learning

The formative activity is based on "[Elections by the Numbers](#)," a lesson on the Elections Canada website.

- We first looked at past elections data and brainstormed inquiry questions about the data
- We discussed as a class how we might answer the inquiry questions, i.e., what information should be included or excluded?
- We looked at data for voter turnout by age, specifically focused on youth, and discussed:
 - Interesting observations about youth voting and reasoning
 - Predictions for youth voting trends in the future and reasoning

Model with mathematics in situational contexts

Reflect on mathematical thinking

NUMERACY:
Interprets—
Understands the
real-world problem

Student inquiry: Building context

- I showed students the Statistics Canada website and asked them to choose from datasets about housing, health, education and employment, or manufacturing

Model with mathematics in situational contexts

- I pre-identified six data sets that were appropriate for my class and encouraged students to use those sets

Student inquiry: Data analysis

- Students created a table of percentage change in at least five categories over time (at least four years)
- Students generated inquiry questions based on their data table

Model with mathematics in situational contexts

NUMERACY:

Interprets—Extracts relevant information

NUMERACY:

Communicates—Represents processes and solution, Explains the approach taken

Student inquiry: Communicating

- Students created a graphic that responds to an inquiry question and effectively presents the data to support their response
- Students answered the questions about their data analysis process and thinking as done in the formative activity

Represent mathematical ideas in concrete, pictorial, and symbolic forms

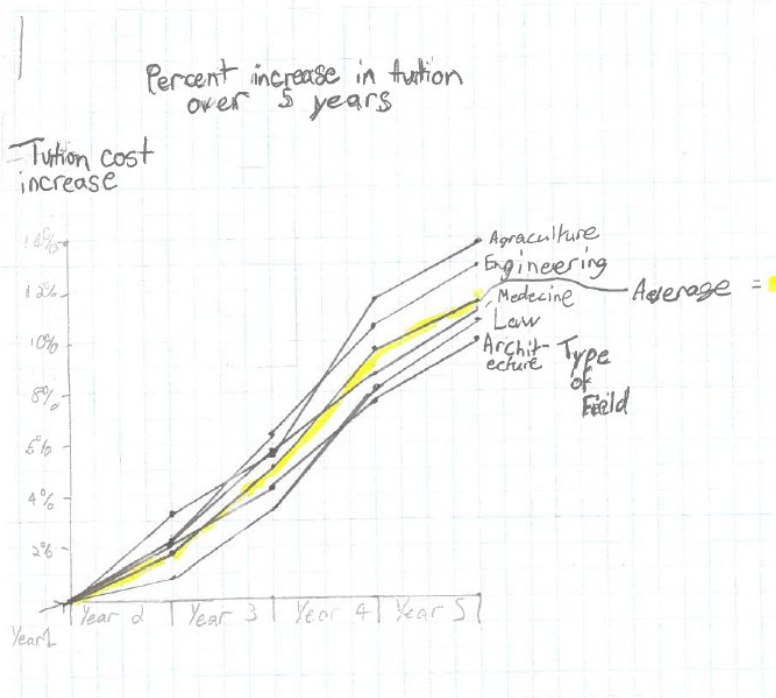
Reflect on mathematical thinking

Demonstrations of Student Learning and Teacher Assessment

How have the tuition costs of the following field changed over the past 5 years?

Between law, engineering, architecture, medicine, and agriculture, natural resources, and conservation there has been an average increase in tuition of 11.45% over 5 years with an average yearly increase of 2.863%. The largest of increase of these fields in natural resources, and conservation with 5-year increase of 13.912%, 2.462% more than average and an average yearly increase of 3.478%. A close second is engineering with a 5-year increase of 12.996%, 1.546% more than average and an average yearly increase of 3.249%.

Student A: Data table, inquiry question, and graph



Raw data	2020/2021	Percent increase	2021/2022	Percent increase	2022/2023	Percent increase	2023/2024	Percent increase	2024/2025	Over all increase	Average per year increase
Law	12,727	0.973%	12,852	2.636%	13,200	4.41%	13,809	3.285%	14,278	10.863%	2.716%
Engineering	8,067	2.301%	8,257	4.189%	8,618	4.159%	8,992	3.02%	9,272	12.996%	3.249%
Architecture	6,462	2.076%	6,599	2.136%	6,743	3.534%	6,990	2.646%	7,180	10%	2.5%
Medicine	14,321	2.092%	14,627	3.706%	15,190	2.828%	15,632	2.538%	16,039	10.711%	2.678%
Agriculture, natural resources, and conservation	5,693	3.279%	5,886	2.437%	6,033	5.969%	6,416	2.979%	6,613	13.912%	3.478%
Averages	9,454	1.972%	9,644	3.14%	9,956	3.964%	10,367	2.89%	10,676	11.45%	2.863%

Teacher's Observations and Assessment

Student A: This student was able to extract the relevant data from the dataset, organize it, perform relevant calculations, and formulate an inquiry question based on their initial observations. They then created a graph that represented the trend in a clear way. They described in their reflection their decision to include and exclude data, but did not explain why. While this student modeled and represented mathematics in a **proficient** way, they are **developing** in their reflection as they did not explain why they chose certain data points.

Student B: Data tables and graphics (right) and Reflection (below)

What information did you include in your image?

I included the percent increase of tuition cost by yearly for law, engineering, architecture, medicine, and agriculture, natural resources, and conservation. I included the average increase of all those fields as a reference point.

What information did you exclude?

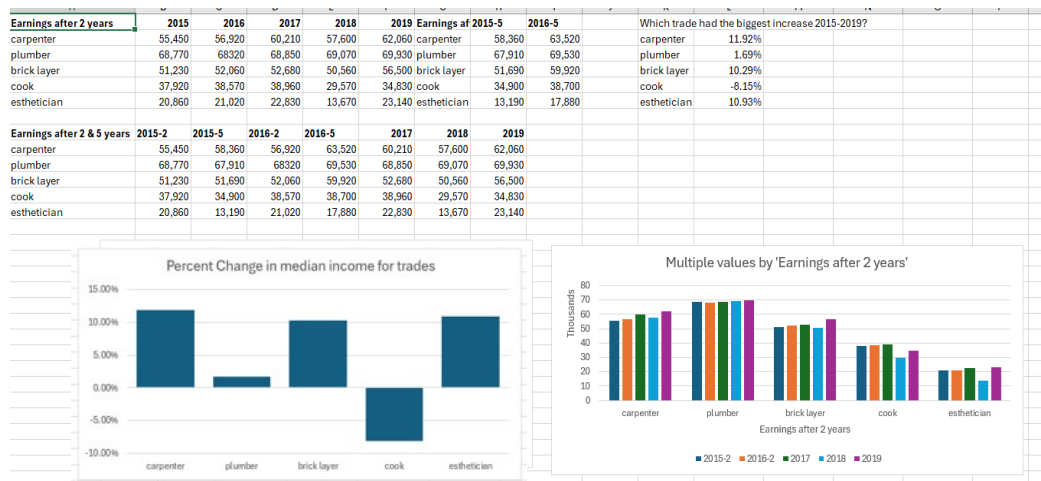
I excluded all other fields of study, and the dollar cost itself of the intuition.

What is interesting or important to you about the data?

It is interesting to see how the tuition cost for all the fields is increasing by itself, relative to other fields I am interested in, and how they are increasing compared to the average and what the average is. This is interesting because it can show trends in different fields increasing more or less than other specific fields or other fields on average. This can show what fields are getting more popular or expensive and what fields might increase less than others over time.

Make a prediction for the future of your data set. What would the data say in 10 years.

I think the yearly increase will not climb at such a high rate as it did as it is on a downhill curve. With that being said, I do still think over the next 10 years the yearly increase rate will go up as over these past 5 years it has increased. So, I think the yearly increase rate of all the fields will go up over an extended period like 10 years due to how over five years it increased but within the next 5 years will slightly increase due to how the rate is on a lower trajectory.



Inquiry question

Which selected trade two years after certification had the biggest increase in median employment income from 2015 to 2019?

The Carpenter had an 11.92% increase in median employment income from 2015 to 2019, which was the biggest increase out of all my selected trades.

Step 5 questions-based on inquiry graph

- I created a bar graph that showed the percentage difference of median employment incomes from 2015 to 2019 of carpenters, plumbers, bricklayers, cooks, and estheticians.
- I excluded the earnings after two years from 2016 to 2018 and the earnings after five years.
- that I found interesting is that every other trade went up except for the cooks, plumbers had a very low increase, likely because they had such high earnings to begin with.
- the cooks a large increase in median employment income to go back to above where they were in 2015, and I think that all the trades will increase because of inflation.

Teacher's Observations and Assessment

Student B: This student was able to extract the relevant data from the dataset, organize it, perform relevant calculations and formulate an inquiry question based on their initial observations and was **proficient** in this part of modelling mathematics. However, they are **developing** in their ability to visually represent their response as they need to more carefully label their graphs to ensure clear communication of the observed trends (other graphs not shown). They are **developing** in their reflection as they described their process and observations but did not explain their decisions.